Journal

of the American Association of Nurse Anesthetists

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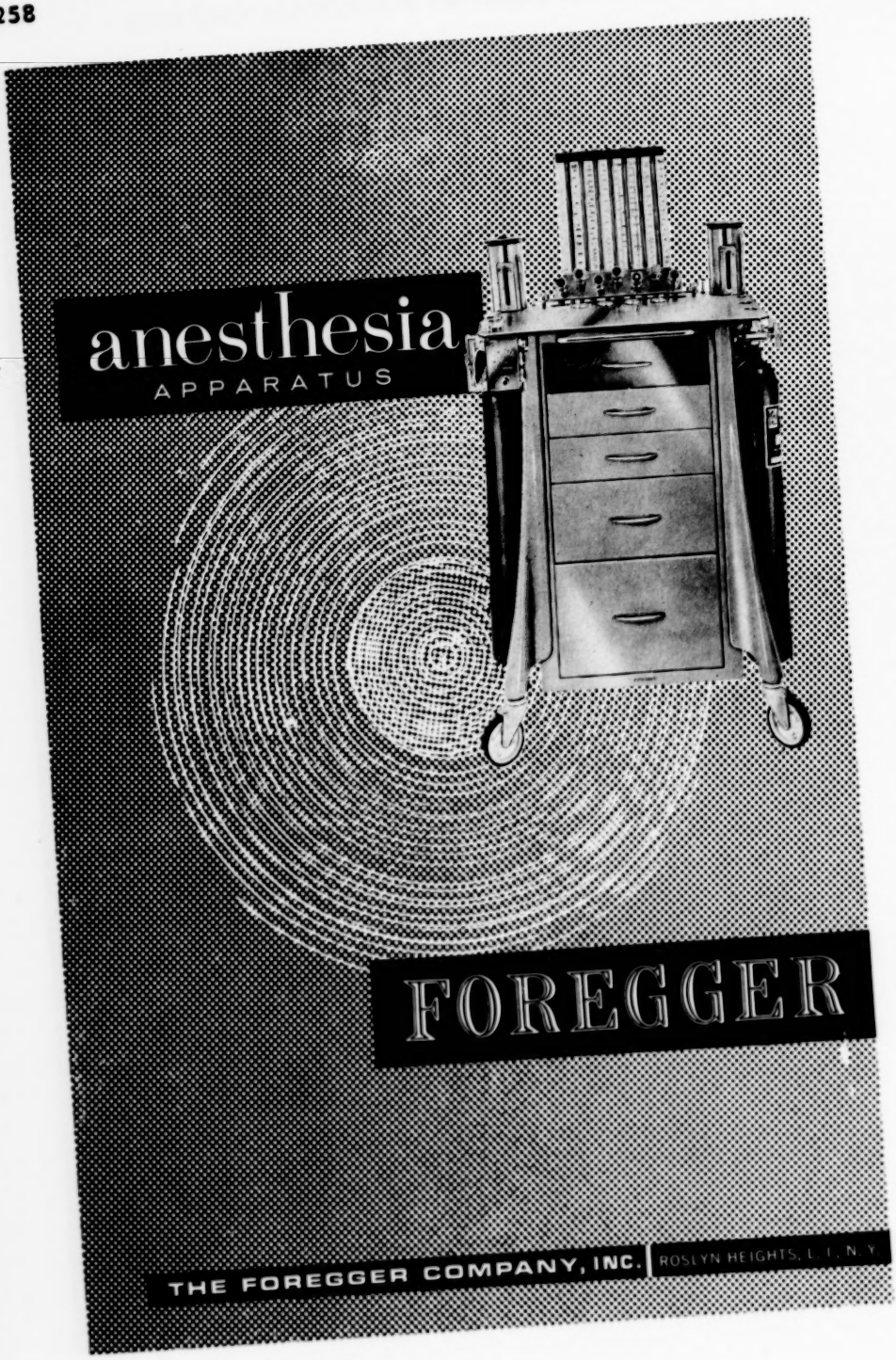
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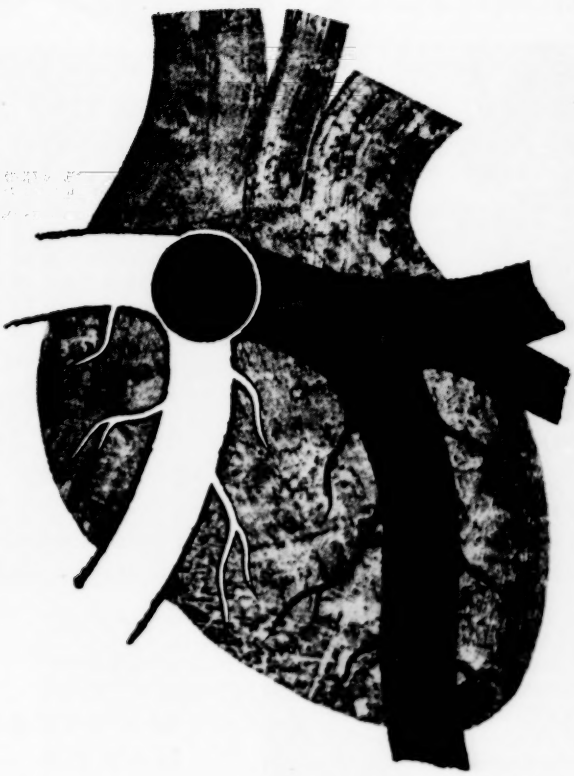

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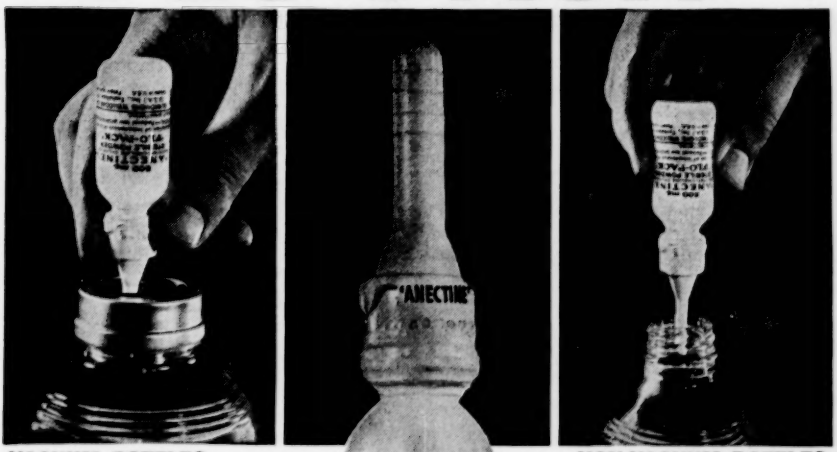

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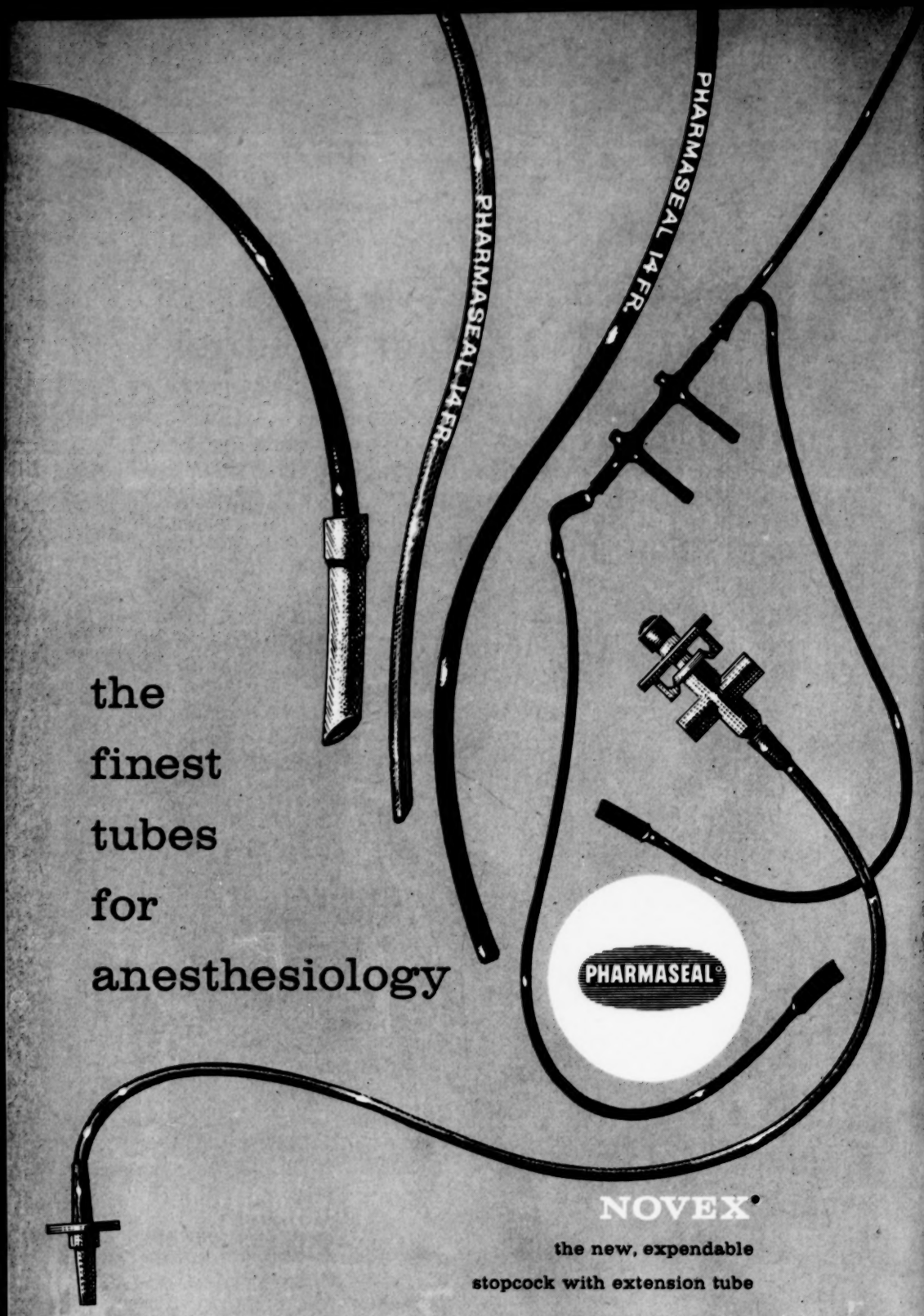

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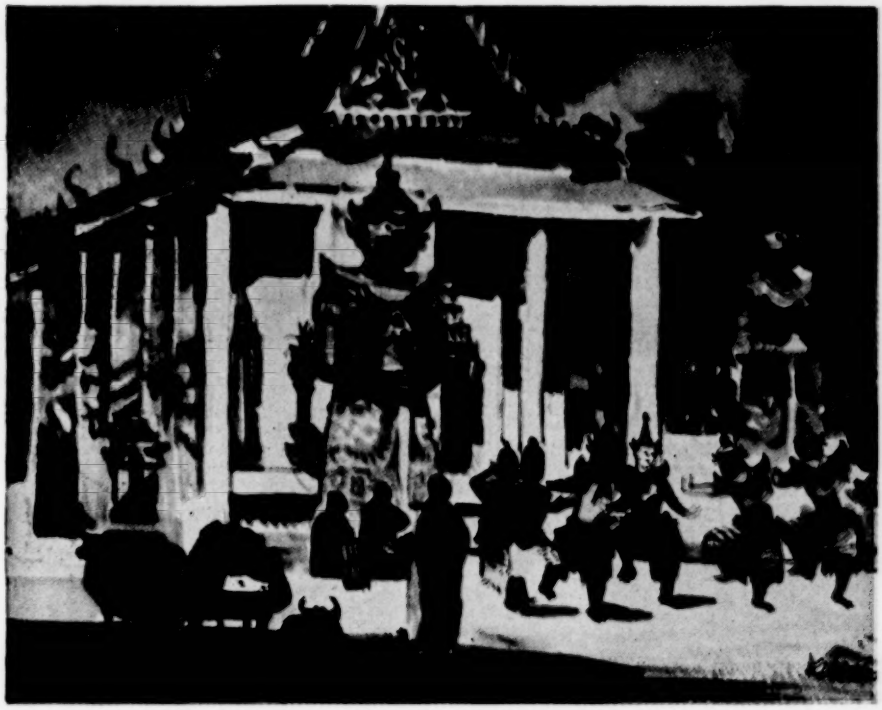

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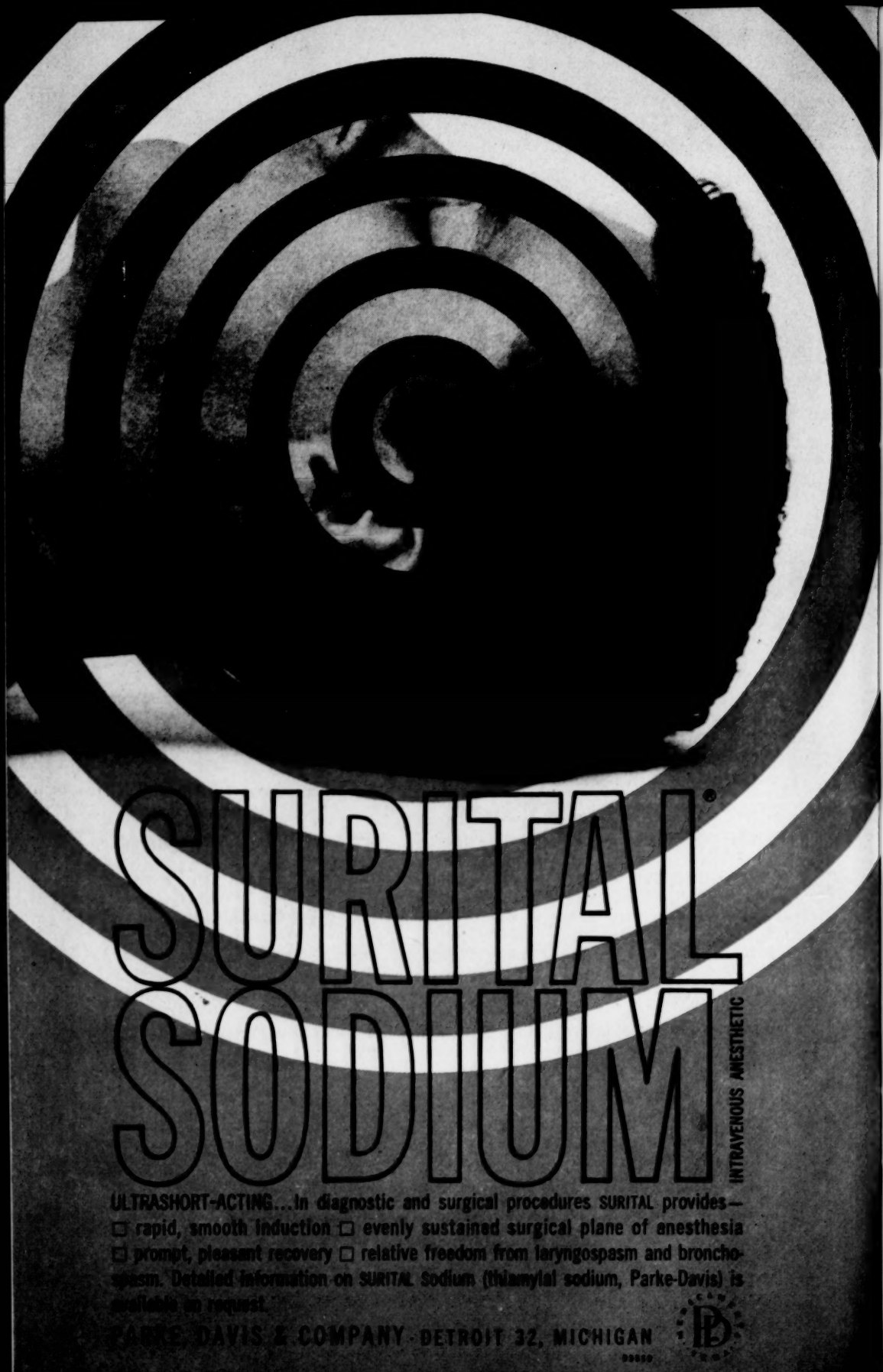
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Standardization of Anesthesia Equipment

Hamilton S. Davis, M.D.* and Lucy E. Richards, C.R.N.A.†
Cleveland, Ohio

The need for standardization in certain items of anesthesia equipment has long been apparent. The rapid growth of anesthesiology has been accompanied by a demand for an increasingly large number and variety of devices required for the administration of anesthetics by the many technics now being used. The number of manufacturers involved in the production of these devices has also increased. The benefits of standardization of such things as characteristics of endotracheal tubes, orifices of connecting pieces, nomenclature and proper labeling as well as units of measure would affect both anesthetists and manufacturers.

Often anesthetists are required to have several different makes of gas machines and accessory equipment. In emergency situations, inability to interchange anesthetic equipment made by different manufacturers may result in delay and confusion and possible danger to the patient.

There are already well-known and useful standards relating to the field of anesthesia. In 1957 the American Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections B57.1-1957,[1] which includes the pin-index system for flush-type cylinder valves, resulted from work that was begun in the 1940's, sponsored by the Compressed Gas Corporation. The National Bureau of Standards in 1941, with the cooperation of the American Society of Anesthesiologists, Compressed Gas Manufacturers Association and the American Hospital Association established the color scheme for identifying medical gas cylinders by endorsing a Simplified Practice Recommendation R 176-51, Color Marking for Anesthetic Gas Cylinders.[2]

Another project "Dimensions of Glass and Metal Luer Tapers for Medical Applications"[3] was approved as an American Standard in 1955. Interchangeability of syringes and hypodermic needles in blood and disaster programs was assured by adoption of this standard.

The National Fire Protection Association Sub-committee on Hospital Operating Rooms has worked out a Code for Use of Flammable Anesthetics (Safe Practice for Hospital

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* Associate Professor of Anesthesiology, Western Reserve University School of Medicine; Director of Anesthesia Department, Lakeside Hospital, Cleveland, Ohio, and Chairman of the American Standards Association Section Committee Z-79, "Standards for Anesthetic Equipment."

† Chief of Anesthesia Department, Lutheran Hospital, Cleveland, Ohio and AANA representative to the American Standards Association Section Committee Z-79, "Standards for Anesthetic Equipment."

Operating Rooms), NFPA No. 56, 1959.[4] An International Organization for Standardization (ISO) has its general secretariat in Geneva, Switzerland. Anesthesiology has been the most active branch of medicine in working toward international standards, Great Britain and the United States being the two more active countries.

A positive approach to the specific problem of standardization of anesthetic equipment was made in 1955 when the American Society of Anesthesiologists, working through American Standards Association, Inc., Sectional Committee Z-79: Standards for Anesthetic Equipment, began working on specifications for endotracheal tubes, connectors and adapters, as well as on standard connections within the anesthetic circuit. The American Society of Anesthesiologists is serving as the administrative sponsor in this work and representatives from manufacturing companies, The American Hospital Association, The American College of Surgeons, The United States Armed Services, The United States Bureau of Mines and The American Association of Nurse Anesthetists are among those participating in this study.

The first project of this committee, relating to standard endotracheal tubes, was approved in April, 1960 by the American Standards Association. It is designated as Z79.1-1960, *American Standard Specifications for Anesthetic Equipment: ENDOTRACHEAL TUBES*. The text of this American Standard follows.

It is of considerable interest that the British Standards Institution, working in close cooperation with the American Standards Association, is currently publishing a standard on endotracheal tubes which is similar to this one. Further, interchangeability of parts throughout the anesthetic circuit is very close to realization between these two countries at the present writing.

American Standard Specifications for Anesthetic Equipment Z79.1-1960: Endotracheal Tubes

1. Scope

1.1 This is the first of a series of standards to be formulated concerning anesthesia supplies and equipment.
1.2 This initial standard concerns specifically endotracheal tubes and cuffs.
1.3 The following are considered: terminology, dimensions, tolerances, labeling, and materials.

2. Terminology

2.1 Endotracheal Tube. An endotracheal tube is a tube which is used to convey gases or vapors to and from the trachea. This term shall be used rather than synonyms such as "intracheal", or "catheter." A typical endotracheal tube is illustrated in Fig. 1.
2.2 Tracheal End (Distal). This shall refer to that end of the endotracheal tube, usually beveled, which is intended to be inserted into the patient's trachea.
2.3 Machine End (Proximal). This shall refer to that end of the endotracheal tube which is intended to project from the patient.
2.4 Bevel. The angle at which the tracheal end of the tube is cut.
2.5 Endotracheal Cuff. That inflatable sleeve which may be applied to the tracheal end of an endotracheal tube to provide an air-tight fit between the tube and the trachea. Typical endotracheal cuffs, both slip-on and permanently-bonded, are illustrated in Fig. 2 and Fig. 3.
2.6 Inflating Tube. That tube provided for inflating the endotracheal cuff.
2.7 Pilot Balloon. A small balloon which may be fitted to the inflating tube to indicate inflation of the cuff.

3. Dimensions and Tolerances of Endotracheal Tubes

3.1 Measurement System. The metric system shall be the standard of measurement used.

3.2 Size. The size, which shall be marked on each tube, shall indicate the tube's internal diameter in millimeters rather than by any other system; i.e., French, Magill, etc.

3.2.1 Designation of tube sizes with reference to length and nominal internal diameter with tolerances is listed in Table 1.

3.2.2 The number of sizes shall be unlimited. Consecutive sizes shall increase by an increment of 0.5 mm. internal diameter.

3.3 Radius of Curvature. Oral endotracheal tubes shall be produced with a radius of curvature (see Fig. 1) of 14 centimeters (cm.) ± 10 per cent; nasal endotracheal tubes shall have a radius of curvature of 20 centimeters (cm.) ± 10 per cent.

3.4 Tracheal End. The tracheal end of the tube shall be rounded and there shall not be a sharp point at the tip of the bevel.

3.5 Bevel. An oral tube shall have a minimum bevel angle of not less than 45 degrees in relation to its long axis. A nasal tube shall have a minimum bevel angle of not less than 30 degrees in relation to its long axis (see Fig. 1). The bevel of the tubes may be made with the opening facing either to the left or to the right when viewed from the concave aspect with the tube held bevel end upwards.

Table 1
Endotracheal Tube Internal Diameters and Lengths

Internal Diameter in Millimeters (Tolerance ± 0.20 mm.)	Minimum Tube Length in Centimeters
2.5	12.0
3.0	14.0
3.5	16.0
4.0	18.0
4.5	20.0
5.0	22.0
5.5	24.0
6.0	26.0
6.5	28.0
7.0	30.0
7.5	31.0
8.0	32.0
8.5	33.0
9.0	34.0
9.5	35.0
10.0	36.0

Table 2
Internal Diameter and Effective Length (Inflatable Portion) of Slip-On Endotracheal Cuffs

Internal Diameter of Cuff in Millimeters (Tolerance ± 10%)	Effective Length of Cuff in Centimeters (Tolerance ± 10%)
5.0	2.0
5.5	2.5
6.0	2.5
6.5	3.5
7.0	3.5
7.5	4.0
8.0	4.0
8.5	4.0
9.0	4.0
9.5	4.0
10.0	4.0
10.5	4.0
11.0	4.0

4. Endotracheal Cuffs

4.1 Types. Endotracheal cuffs may be either of the slip-on or permanently-bonded type.

4.2 Slip-On Cuff (see Fig. 2). For test purposes the mounted cuff shall expand symmetrically when inflated with air to at least 1½ times the external diameter of the endotracheal tube.

4.2.1 Nomenclature. The designation of the cuff shall be descriptive.
Examples: Single wall, low pressure
Double wall, flat
Double wall, bulge

4.2.2 Sizes. Sizes shall indicate the internal diameter of the cuff unmounted expressed in millimeters.

4.2.3 Cemented Ends of Cuffs. The maximum length of cemented ends of cuffs shall not exceed 1.0 centimeters.

4.2.4 Lengths of Cuffs. The effective length (the inflatable portion) of the cuff shall be in accordance with the sizes indicated in Table 2.

4.2.5 Inflating Tube. The external diameter of the inflating tube shall not exceed 3.0 mm., it shall come off the cuff at a flat angle without undue projection, and it shall either be fitted with a Luer syringe mount or shall have a female conical-shaped end capable of fitting a standard Luer syringe tip (American Standard Dimensions of Glass and Metal Luer Tapers for Medical Applications, Z70.1-1955). The minimum length of the inflating tube shall be as follows: 28.0 cm. for cuffs fitting tube size 6.5 mm. internal diameter or less; 34.0 cm. for cuffs fitting tube sizes 7.0 mm. to 8.0 mm., inclusive; 40.0 cm. for those fitting 8.5 mm. or larger.

4.2.6 Pilot Balloon. A pilot balloon, if attached, when deflated shall lie flat and shall be so constructed as to give adequate indication of inflation of the mounted cuff at the pressure required to distend the cuff to 1½ times the external diameter of the endotracheal tube.

4.3 Permanently-Bonded Cuffs. (See Fig. 3.) The cuff shall be permanently bonded onto the tube and shall expand symmetrically when inflated with air to 1½ times the external diameter of the endotracheal tube.

4.3.1 Position. The distance from the end of the cuff to the nearest portion of the bevel shall be 1.0 to 1.25 cm.

4.3.2 Length of Cuffs. The effective length of the cuff shall be in accordance with the limits shown in Table 3.

Table 3
Internal Diameter and Effective Length (Inflatable Portion)
of Permanently-Bonded Endotracheal Cuffs

Internal Diameter of Tube in Millimeters (Tolerance ± 0.20 mm.)	Effective Length of Cuff in Centimeters (Tolerance ± 10%)
5.0	2.0
5.5	2.5
6.0	2.5
6.5	3.5
7.0	3.5
7.5	4.0
8.0	4.0
8.5	4.0
9.0	4.0
9.5	4.0
10.0	4.0

* * * *

Anesthetists in the near future will receive endotracheal tubes conforming to this standard. Tubes of non-standard design for special uses will continue to be available upon request to the manufacturers.

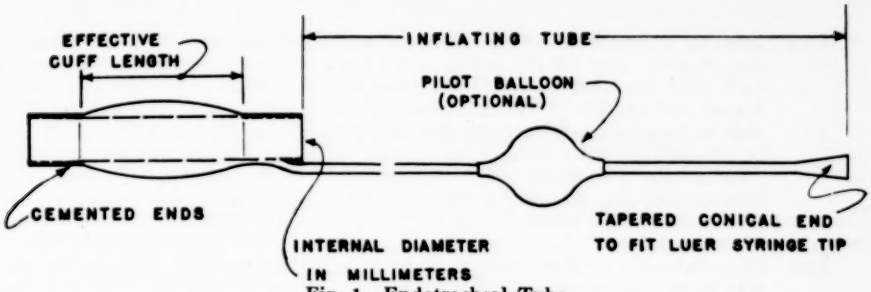

Fig. 1 Endotracheal Tube

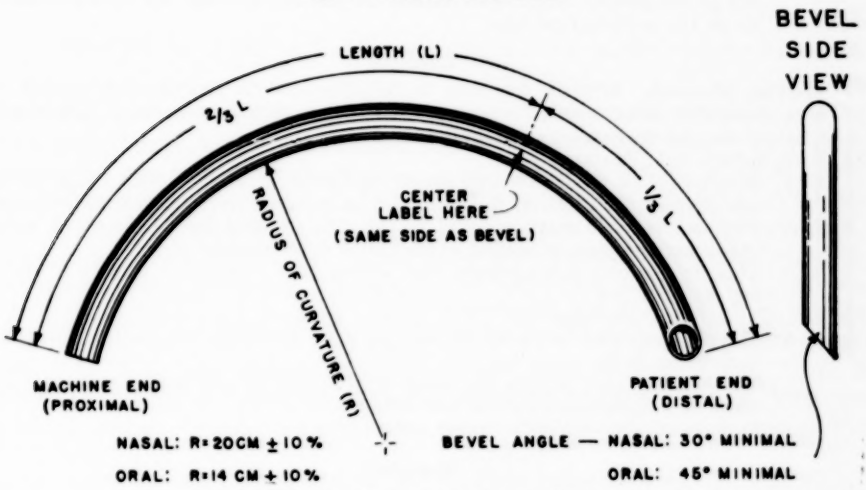

Fig. 2 Unmounted Slip-on Cuff

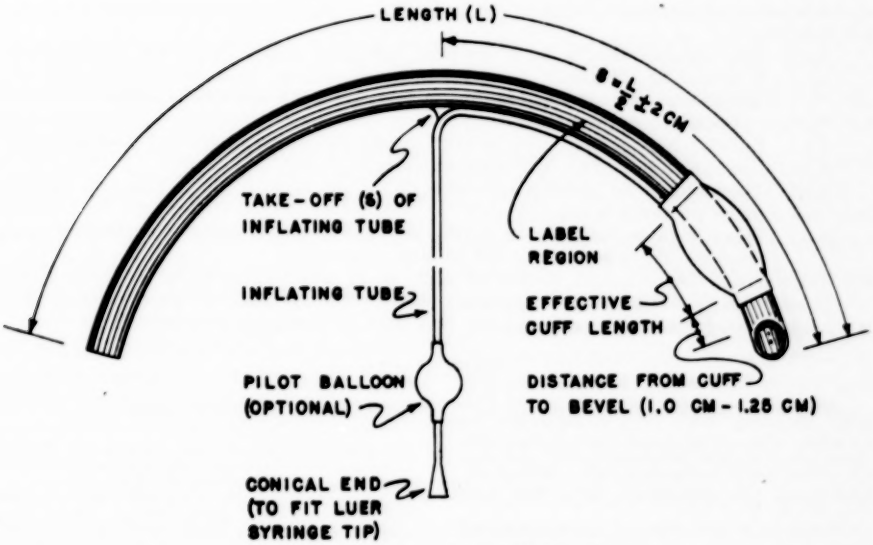
LENGTH (L)
TAKE-OFF (S) OF INFLATING TUBE
INFLATING TUBE
PILOT BALLOON (OPTIONAL)
CONICAL END (TO FIT LUER SYRINGE TIP)
LABEL REGION
EFFECTIVE CUFF LENGTH
DISTANCE FROM CUFF TO BEVEL (1.0 CM - 1.25 CM)

Fig. 3 Permanently Bonded Cuff

4.3.3 Inflating Tube. The external diameter of the inflating tube shall not exceed 3 mm., it shall come off the cuff at a flat angle without undue projection, and it shall either be fitted with a Luer syringe mount or shall have a female conical-shaped end capable of fitting a standard Luer syringe tip. The inflating tube shall be attached to the endotracheal tube at the mid-point $\pm$ 2.0 cm. and shall be attached in such a manner that it may be partly stripped off from the endotracheal tube if required. The minimum length of the inflating tube shall be as follows: 28.0 cm. for cuffs fitting tube size 6.5 mm. internal diameter or less; 34.0 cm. for those fitting 7.0 to 8.0 mm., inclusive; 40.0 cm. for those fitting 8.5 mm. or larger.

4.3.4 Pilot Balloon. A pilot balloon, if attached, when deflated shall lie flat and shall be so constructed as to give adequate indication of inflation of the mounted cuff at the pressure required to distend the cuff to 1½ times the external diameter of the endotracheal tube.

5. Labeling

5.1 Marking Materials. Marking materials to be placed on the product itself should be of a contrasting color, should be nontoxic, compatible with human tissue, and should resist agents used in cleansing and sterilizing.

5.2 Endotracheal Tube Markings

5.2.1 Markings shall be of sufficient size to be clearly legible and shall be placed at one-third of the length of the tube from its bevel on the same side as the bevel.

5.2.2 The only required markings shall be the tube size and the word oral or nasal. Other markings may be applied at the option of the supplier.

5.2.3 The size number, in accordance with section 3.2.1 (Table 1), shall be marked; for example, 10.5.

5.3 Endotracheal Cuff Markings

5.3.1 The markings shall be placed on the cuff itself or, failing this, on the marketing package, or both.

5.3.2 The marking shall include the name of the cuff, the size of the cuff, and the range of endotracheal tubes the cuff will fit.

5.3.3 Permanently-bonded cuffs require no marking.

6. Materials

6.1 General. Because of the continuing rapid development of new materials, no rigid standards have been formulated at this time. However, in general, the following characteristics are desirable.

6.2 Inertness

6.2.1 The material should be a nontoxic substance compatible with human tissue.

6.2.2 It should be reasonably resistant to agents used in chemical cleansing and sterilizing and to deterioration from autoclaving and anesthetic agents.

6.3 Surface Characteristics

6.3.1 Endotracheal Tubes. The surface should be smooth externally and internally.

6.3.2 Endotracheal Cuffs. The external surface should be smooth.

6.4.1 The material for endotracheal tubes should be rigid enough to maintain a curved shape when not in use.

6.4.2 When in place, it should be flexible enough, or should soften sufficiently at body temperature, to conform to the patient's anatomy.

6.5 Durometer. The material should be such as to allow construction of endotracheal tubes with the thinnest possible walls which will not kink or become compressed unduly when in place in the patient regardless of extremes of position.

References

[1] American Standard B57.1 - 1957, and Canadian Standard B-96 - 1957: Compressed Gas Cylinder Valve Outlet and Inlet Connections, American Standards Association, Inc. and Canadian Standards Association, Inc.; 3rd edition, Compressed Gas Association, Inc., New York City 17, N. Y.

[2] Simplified Practice Recommendation R176-41: Color Markings for Anesthetic Gas Cylinders. U. S. Department of Commerce, National Bureau of Standards; U. S. Government Printing Office, Washington, D. C., 1941.

[3] American Standard Z70.1 - 1955: Dimensions of Glass and Metal Luer Tapers for Medical Applications. American Standards Association, Inc., New York City 17, N. Y.

[4] Standard No. 56: Code for Use of Flammable Anesthetics (Safe Practice for Hospital Operating Rooms), June 1959. National Fire Protection Association, 60 Batterymarch Street, Boston 10, Massachusetts.

Geriatric Anesthesia

William B. Gallagher, M.D., F.A.C.S.*
La Crosse, Wisconsin

History of Anesthesia

Effective, safe, and controllable pain relief — "anesthesia" — is a recent phenomenon in the pain-racked history of mankind.[1] However, attempts to relieve pain are ancient. The earliest reference to this subject in any literature is in the second chapter of the Book of Genesis. "Then the Lord cast a deep sleep upon Adam, and when he was fast asleep He took one of his ribs and filled up flesh for it." At Calvary the soldiers offered Christ "wine mixed with gall," according to Saint Matthew, or "wine mixed with myrrh," as Saint Mark has it. The exact nature of the substance is not clear, but the aim was presumably analgesic. Dioskorides, a Greek surgeon in the Roman army, recommended wine and mandragora (mandrake) root, to be swallowed prior to painful manipulations or incisions. Mandragora is mentioned frequently in the old literature. It is of the "deadly nightshade" plant family, and the active ingredient was belladonna. Cannabis, or hemp, was another substance recommended for pain relief. It is identical with today's marijuana. The ancients also used henbane, or hyoscyamus; its active substance — scopolamine.

These drugs were potent, but unstandardized and toxic. They could produce only limited analgesia short of dangerous coma. Alcohol and opium were the two mainstays of the ancient anesthetist's armamentarium. Of these two, at least the opium was analgesic, but here again the preparations were unstandardized and effects could vary from little pain relief to death from narcosis. Also, they had to be swallowed, and in considerable quantity.

The Salerno, Italy, medical school, in the 11th century, recommended the "soporific sponge" — a sponge soaked in a mixture of opium, hyoscyamus, mandragora, and hemlock. This sponge was moistened and inhaled to produce narcosis.

These agents all fell into discard, either due to toxicity or lack of effect. The surgeons of the Renaissance and later, preferred to operate without narcosis. The patients were held or strapped down, and there was a great premium on speed on the part of the operator. Operations were limited to the extremities, and were mainly amputations. The horror of the operating rooms in those days can only be imagined. Here is an account by an English medical student in 1751. On his first day in the hospital he witnessed an emergency amputation.[1d]

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* St. Francis Hospital and Skemp Clinic. La Crosse, Wisconsin.
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"(The surgeon) was then . . . performing an amputation of the thigh upon a porter, brought in that morning from Covent Garden with a compound fracture of the left femur, the result of a kick by a horse. . . . The incisions were placed high upon the thigh . . . from the plunging of the patient, who seemed unable to comprehend that it was done for his own good, ten minutes elapsed before the leg lay on the floor, and much blood was shed. . . . The patient, being a poor man, had few friends able to make him drunk . . . many ropes were necessary to control his struggles. . . . I wished to enquire what chances for recovery were, but after one attempt gave it up as the screams of the porter made speech impossible. . . . The next morning I hear that the porter is dead."

An opportunity had been lost when, in 1540, Paracelsus experimented with "sweet vitriol" — a volatile liquid made by combining sulfuric, or vitriolic, acid and alcohol. The result — divinyl ether. He fed it to chickens and noticed that they slept, and awoke undamaged. Paracelsus wrote, "I think it is noteworthy that its use may be recommended for painful illnesses, that it will mitigate the disagreeable complications of these." This suggestion unfortunately died with Paracelsus.

Mesmer developed hypnotism in the late 18th century; it enjoyed a vogue and a few operations were performed under hypnotism. However, Mesmer was a showman rather than a scientist; and perhaps never realized what he had discovered. In any case hypnotism, or "Mesmerism" as it was called, was difficult to induce and unpredictable.

Priestley, in 1772, produced nitrous oxide. Humphrey Davy in 1798 accidentally inhaled this gas and noticed its ability to produce analgesia and exhilaration. Michael Faraday, in 1818 rediscovered ether's similar properties on inhalation. However neither of these investigators thought of any clinical application. Nitrous oxide and ether became available, but were used mainly for "ether frolics" and "laughing gas" demonstrations.

At long last the times were ripe, and general anesthesia became a reality in different places almost simultaneously. Dr. Crawford Long, in Georgia (1842) used ether to perform minor surgery painlessly. However, he did not publish his results. Horace Wells, a New England dentist, impressed by a tent show demonstration of "laughing gas", extracted teeth painlessly under nitrous oxide inhalation, but failed in a demonstration of his method at the Massachusetts General Hospital. Alas—the patient was an alcoholic and had a tolerance for the nitrous oxide. Wells later had a patient die under nitrous oxide anesthesia — he became depressed and committed suicide. William Morton, former associate of Wells, picked up the loose ends, and on a suggestion from a Harvard chemist, Jackson — used ether by inhalation. His demonstration of ether, on a patient of Dr. John Warren on October 12, 1846, was a success. Warren's classical remark has gone into the history books: "Gentlemen, this is no humbug!"

Oliver Wendell Holmes coined the term "anesthesia" after this momentous occasion to describe the painless state produced by ether. The news quickly spread to Europe, and within a month the great London surgeon, Robert Liston, who could amputate a leg in less than a minute, tried

ether. As he started his operation, he remarked to the assembled gallery, "Gentlemen, we are going to try a Yankee dodge to make men insensible." After the quick operation, which was completely painless, the elated Liston cried out, "This Yankee dodge, gentlemen, beats Mesmerism hollow!"

Simpson, a Scottish obstetrician, developed the use of chloroform, and chloroform and ether ushered in the modern era in surgery and anesthesia. Chloroform was cheaper, quicker, more pleasant to smell, less nauseating and less irritating than ether. Also, it was not inflammable. It took a long time to discover that it was also more dangerous. In the American Civil War chloroform was used in 76% of the cases, and ether in 14%.

In 1868 Andrews, in Chicago, added oxygen to nitrous oxide to combat cyanosis, thus improving one of nitrous oxide's disadvantages.

In 1884 Koller discovered that cocaine, an alkaloid derived from the coco bean, produced topical anesthesia. Halsted developed the use of cocaine by injection, to block nerve conduction and thus secure regional, or local anesthesia.

The subsequent development of anesthesia has been that of a progressive refinement in techniques, with an increasing number and variety of agents, singly and synergistically administered. Waters began the use of cyclopropane in 1933. Lundy introduced intravenous Sodium Pentothal, which revolutionized the heretofore stormy "induction" period. Intratracheal cannulation was begun in 1909 by Meltzer. Griffith, of Michigan, introduced curare, for muscle relaxation. The muscle relaxants permit adequate relaxation with lighter planes of anesthesia.

Geriatric Anesthesia

With the development of general anesthesia in the 19th century, using nitrous oxide, ether, and chloroform, surgeons began extending their endeavors to parts of the body previously considered inviolate. Pasteur's and Lister's discoveries led to aseptic surgery, and the problem of surgical infection diminished precipitously. With asepsis and anesthesia, modern surgery advanced swiftly. By 1900 large numbers of operations were being performed, and one discovery followed another.

The improvement over the preaseptic, pre-anesthetic age was clear —but the dangers of general anesthesia, particularly in older and poor-risk patients was early apparent. Patients went into shock—postoperative courses were marred by pulmonary complications. Surgeons tended to limit their operations to the younger, more robust patients, who could "stand the anesthetic". But so frequently it was the old patient who needed surgery.

Anoci-association

Harvey Cushing,[2] in 1902, did a shoulder amputation under ether anesthesia. When Cushing severed the patient's brachial plexus, the patient suddenly went into shock. On two subsequent cases Cushing injected the brachial plexus with cocaine prior to cutting it, and no shock ensued. Presumably blocking the afferent impulses from the nerves somehow prevented shock. Cushing suggested that combining the two forms of anesthesia might frequently be advantageous.

George Crile,[3] of Cleveland, became interested in combining anesthetics. He showed experimentally that the volatile inhalation anesthet-

ics abolish the perception of pain by suspending function in the cerebral cortex. However they have little effect on the lower brain centers—the reflex centers of the medulla and hypothalamus — and no effect on the peripheral nerves. During an operation traumatic stimuli from the area of operation are constantly occurring, though not perceived by the unconscious patient. These stimuli from the peripheral nerves can cause serious reflex effects through the spinal cord and medulla. Muscular contractions, quickened heart beat or disturbed respirations all represent reflexes arising from the field of operation and producing their effects on subcortical, unanesthetized brain cells.

No general anesthetic protects the brain during operations from harmful stimuli or reflexes. General anesthesia prevents the psychic stimuli (preoperative narcosis can minimize or even eliminate psychic stimuli also). Local anesthetics block the nerve paths from the site of operation and prevent traumatic noxious reflexes.

On the basis of his animal research, Crile operated on patients with a preoperative medication of scopolamine and morphine, and he supplemented ether inhalation with regional procaine block to the operative field. The results in his hands were smooth, shockless operations. He coined the term, "anoci-association" to denote the a-noxious, or virtually harmless anesthetic combination.

Subsequent developments — Lundy's Pentothal for induction, Griffith's curare for muscle relaxation, and endotracheal techniques have obscured the place of local anesthesia. Increasing numbers of anesthesiologists and anesthetists are becoming available, and today's surgery resident usually becomes dependent during his training on talented professional anesthetists. Neither the young surgeon nor the young anesthesiologist or anesthetist realizes that much surgery can be done under local anesthesia alone, or that local added to general diminishes the amount of depressing drugs, inhalants, and muscle relaxants needed.

What about the geriatric patient? Each one is an individual, it's just that the older patient is more likely than a young patient to have other diseases besides the one that requires surgery. The literature on this subject is full of cliches, obvious statements, and impossible admonitions. Everything must be done "carefully", and be "complete". The geriatric patient must have a "careful pre-operative workup". One must "replace nutritional deficits" and "restore the cardiac reserve".

Pre-operative Evaluation

The pre-operative evaluation is built around the history and physical examination. Laboratory aids are the blood count, urinalysis, chest plate, certain blood chemistries, and an electrocardiogram. The history should include what medications, if any, the patient has been taking. The population is consuming quantities of steroids, tranquilizers, rauwolfia preparations and oral hypoglycemics.

1. Cardiovascular status. Arteriosclerosis diminishes the elasticity of the patient's coronary, cerebral, and mesenteric vessels. There may also be anemia and diminished blood volume, difficult to detect. These conditions make the aged patient less able to cope with anesthetics, blood loss, and infection.

2. Respiratory system. Emphysema, or "barrel-chest", is an expansion and loss of elasticity of the lungs and chest wall. The result is inadequate ventilation and poor mixing of inhaled gases. Arterial oxygen drops and carbon dioxide rises. The diaphragm is hyperactive. Secretions accumulate.

3. Excretory system. Liver and kidneys become fibrotic, with loss of tissue cells. This interferes with detoxification and excretion of administered drugs.

4. Gastrointestinal tract. This is the site of much disease in the aged — ulcers and cancers of stomach and colon. Nutritional deficiencies are the usual accompaniment.

5. Metabolism. Diabetes and hypothyroidism are common in the aged.

6. Nervous system. Narcotics and barbiturates must be kept in low dosage.

Pre-operative Preparation

The patient is hydrated, transfused, and treated for heart failure, diabetes, pulmonary and urinary infections, if present. For elective operations, of course, more complete restoration can be carried out. Cole[4] has demonstrated that elderly patients tolerate major elective surgery of "moderate magnitude" (breast, gallbladder, stomach, hernia and thyroid) as well as younger patients. However in operations of greater magnitude (such as esophagectomy, pneumonectomy, or abdominoperineal resection) the mortality in patients over 60 was two to four times that of patients under 60. Also, emergency operations were not as well tolerated by the elderly.

One should not sell the oldster short. The very fact that a person has lived to be 80 demonstrates stamina. Statistically the 80 year old has 5.4 years left to him — a 90 year old has three years. The figure for a 70 year old is 10 years.

Pre-operative Medication

The pre-operative medication is a vital adjunct. The following drugs are useful: 1. Demerol; — in small doses (25-50 mgm.) this agent is less depressing and more predictable than morphine.

2. Phenobarbital; — 60-120 mgm. to allay apprehension and minimize toxicity from the local anesthetic agent, if one is to be used.

3. Atropine; as is usually used before a general anesthetic, to diminish bronchial secretions and vagal tone.

4. A phenothiazine derivative (Phenargan or Trilafon) to potentiate the Demerol and phenobarbital and diminish nausea.

Technique

The purpose of the surgeon and anesthetist is to secure analgesia and muscle relaxation adequate for the operation, with the least physiological disturbance. There is no set pattern as to how to reach this goal. The experience and skill of the anesthetist and surgeon, plus the nature of the operation and the condition of the patient are all pertinent.

The patient can either be put to sleep first and the local anesthetic added ("general-local") — or the regional block done first and the patient put to sleep only for the most difficult part of the procedure ("local-general"). Intravenous Demerol can be administered during the operation, and this may cut down or eliminate entirely the need for unconsciousness.

Anesthetic Agents

Nitrous oxide: 1:1 with oxygen, a good analgesic inhalant mixture for geriatric surgery;[5] goes well with local anesthesia supplement; "nitrous" doesn't give muscle relaxation, but this is less important in geriatric surgery; the patients' musculature is often atrophied and lacking in tone.

Ether: The only general anesthetic which doesn't depress breathing — it actually stimulates respirations; the disadvantages of slow induction, bronchial irritation, and postoperative nausea are well-known.

Cyclopropane: Induction is rapid, a high concentration of oxygen can be given, and "cyclo" provides muscle relaxation. Light cyclopropane anesthesia does not disturb the heart[6] (in arrhythmias it is contraindicated); can be combined with ether or local.

Vinethene, Trichlorethylene: These agents are shortacting and analgesic only.

Muscle relaxants: These are often unnecessary in the aged, or local anesthesia can substitute for them: they produce respiratory depression, hypotension, and are eliminated slowly. However, used cautiously and skillfully, the newer rapidly excreted agents can be invaluable, particularly in abdominal closures.

Topical anesthesia for passing endotracheal tube: 2% pontocaine or 4% Xylocaine or 5% Cyclaine spray or swab—to pass endotracheal tube with patient awake.

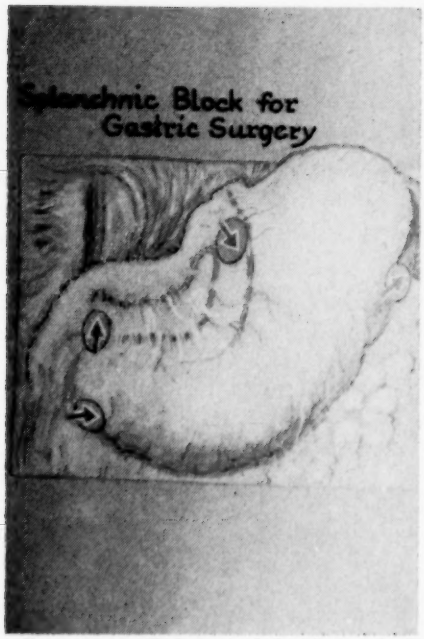
Local anesthetics (Procaine, Pontocaine, Cyclaine, and Xylocaine) Regional blocks:

1. Cervical block: For thyroidectomies, pharyngeal diverticula, thyroglossal cysts.
2. Brachial plexus block: Shoulder dislocations, brachial arterectomies, elbow, wrist and hand fractures, tendon repairs — all upper extremity work.
3. Intercostal block: For anesthesia upper abdominal wall.
4. Splanchnic block: for visceral relaxation.
5. Intraperitoneal topical (2% Xylocaine): for visceral relaxation.
6. Peripheral nerve blocks:
   a. Ilioinguinal and iliohypogastric — for hernia.
   b. Median, ulnar, and radial — for hand work.
7. Spinal — for perineum and lower extremities.
   Note: Contra-indicated in hemorrhage or shock.

Ideally, the patient should be awake at the end of the procedure, with blood replaced.

Discussion

In geriatric anesthesia the narrow margins of safety make the problems of anesthetist and surgeon more delicate. These patients are more prone to shock during the operation, and pulmonary, coronary and renal disturbances afterward. Experience indicates that the less general anesthetic agent used on an aged patient, the better. The relaxant drugs have been a help, but they have their own dangers. One need only ponder on the incidence of cardiac arrest over the last 10 years to realize the dangers in our present complex combinations of anesthetic agents. And how many times has a patient had prolonged apnea following an operation, necessitating hours of assisted respiration?



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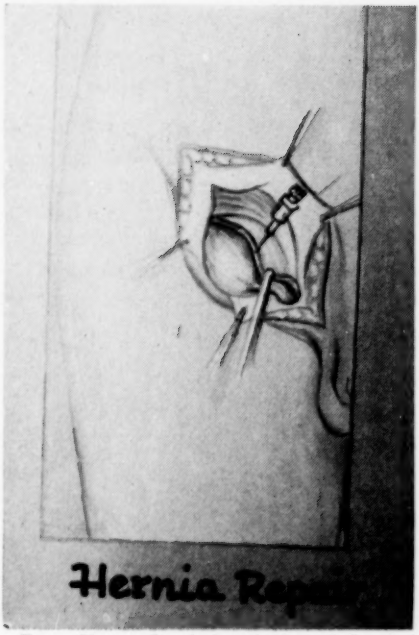

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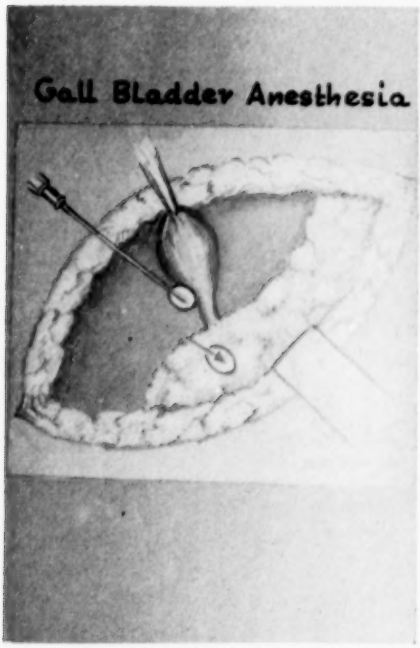

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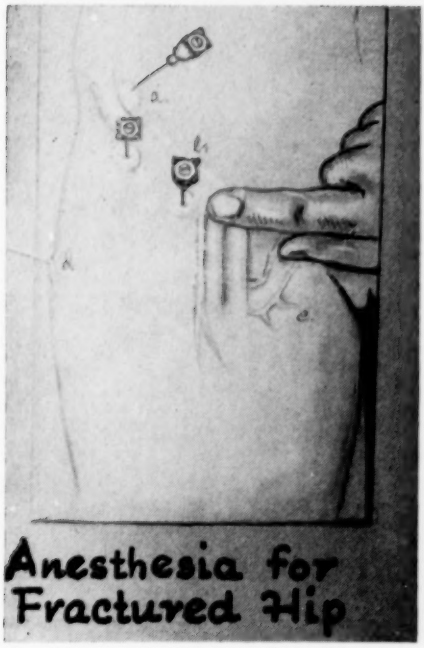

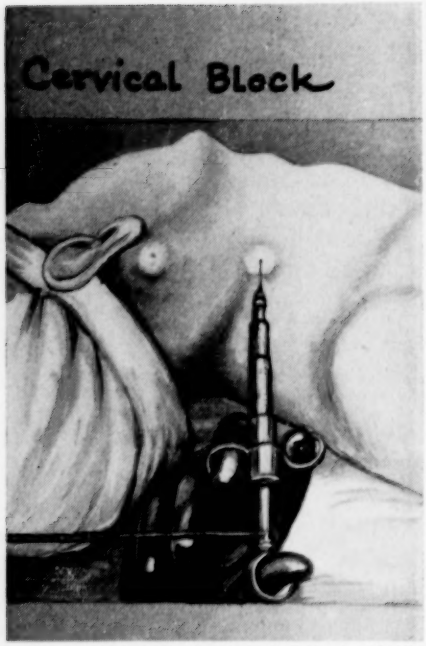

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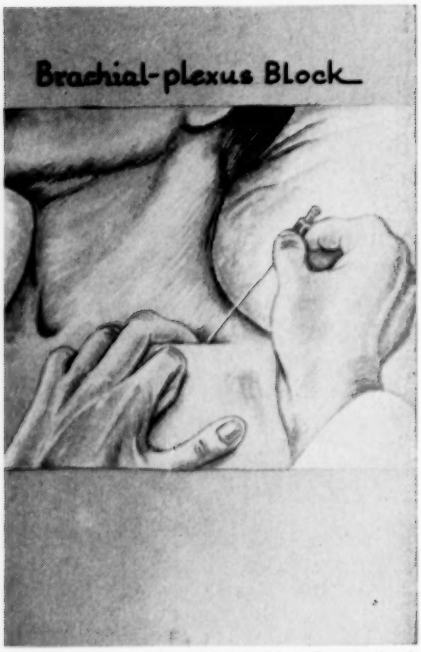

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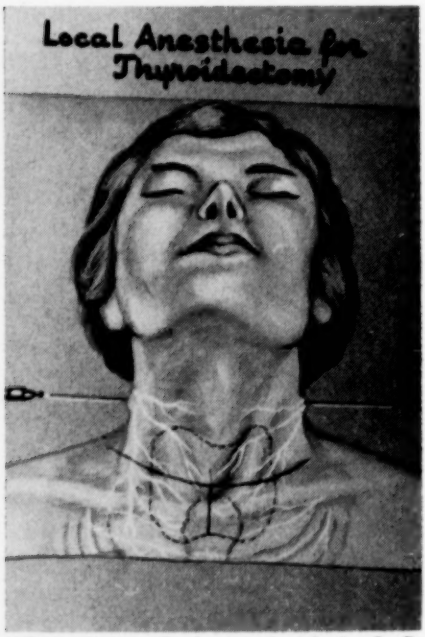

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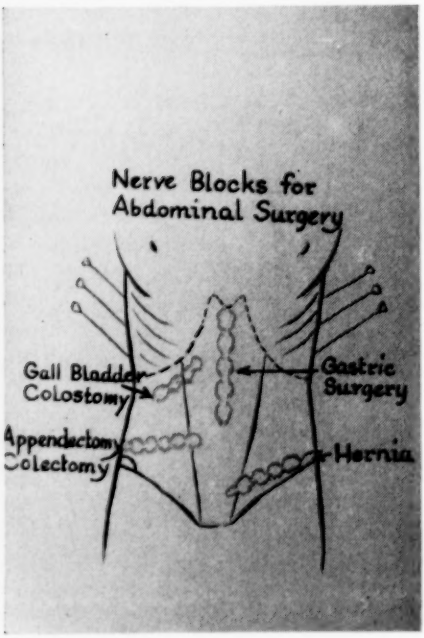

Glover,[7] of Cleveland, has said, "Much surgery can be done comfortably and safely with local anesthesia alone . . . the use of local anesthesia can make poor general anesthesia better and good general anesthesia safer. By producing his own muscle relaxation the surgeon makes the anesthesia smoother and often obviates the necessity for deep anesthesia and muscle relaxants."

Summary

1. Many operations can be performed under local anesthesia, alone.
2. Where unconsciousness is required or desired, local anesthesia as an auxiliary diminishes the amount of depressing systemic narcosis and reduces some of the complications of general anesthesia.
3. These methods are particularly applicable to the geriatric patient.

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Surital Sodium for Obstetrical Anesthesia

Mrs. Norbeth Koonce, C.R.N.A.*
DuQuoin, Illinois

Surital Sodium has been used in a series of more than 1200 obstetrical cases at Marshall-Browning Hospital in DuQuoin, Illinois. We would like to share with you the experiences we have had in administering this number of anesthesias for obstetrical purposes only.

When Surital was first introduced to our Anesthesia Department, one of the questions we asked was: "How is the undelivered fetus affected by Surital Sodium?" We asked this question in particular reference to using Surital for anesthesia in Caesarean section. This question we asked of the Parke-Davis representative was forwarded to Dr. John E. Gajewski in Detroit, Michigan, and the answer we received was to the effect that Surital Sodium crossed the placental barrier at about the same rate of speed as did Pentothal Sodium —but because Surital was much more potent and less of the drug was required, there would be less of the drug to affect the baby. After receiving this information, all Caesarean sections were performed under Surital-nitrous oxide-oxygen-cyclopropane combination. Detailed records were kept in each case, with special attention given to the time element of the cry of the newborn baby. There was no greater incidence of delayed cry in the newborn baby with Surital-gas combination than there was with any other type of anesthesia that had been given previously for Caesarean section.

Quite by accident we began using Surital in delivery room procedures. One patient about to be delivered had previously experienced such violent dreams following nitrous oxide anesthesia that the doctor requested that an intravenous anesthesia be used instead. Surital, nitrous oxide and oxygen were given this patient. Everyone in the delivery room was exceedingly well pleased with the results of this anesthesia—but happiest of all was the patient! This particular anesthetic was the topic of conversation among all members of the obstetrical team in the room at the time of delivery. That was the beginning of our series, and gradually all staff doctors came to accept Surital-gas combination as being routine anesthesia for delivery procedures.

Equipment

The basic equipment used is the same as for the management of any general anesthetic. There is a gas machine. The usual stimulants and fluids are available for immediate emergency use if necessary. There is a routine intravenous tray fitted with these specific items for administration of Surital Sodium: A 20 cc.

This series of cases was prepared with the help of Miss Susannah Poole, C.R.N.A.
*Marshall-Browning Hospital.

Luer-lock syringe, a short length of disposable intravenous tubing with a needle adapter, a 20 gauge needle and small hemostat for clamping off the tubing when it is not in use.

For cases done in Surgery, the Surital is administered through a Thomas clamp, which is attached to the arm-board. On the Obstetrical division, we use a 20 cc. syringe with the tubing and needle attached. The syringe is filled with 2.5% Surital—all air is ejected from the syringe and tubing—and the hemostat is clamped to prevent solution from leaking out or the blood from flowing back up through the tubing into the syringe. It has been observed that during contractions there seems to be considerable back pressure of blood unless the tubing is clamped. It is an easy and an economical thing to use this hemostat routinely. If there has been no blood back-up and there is solution remaining in the syringe after completion of an anesthetic, that solution is either returned to the stock bottle or is left in the syringe—the tubing is removed and a sterile rubber tip is placed over the syringe tip. The syringe is wrapped in a towel and ready for use on the next patient by merely attaching a new tubing.

Our obstetrical patients are placed in lithotomy position. The arms are straight at the sides and the wrists are secured in wrist-straps. Venipuncture is done in the vein most convenient for the anesthetist. In using the patient's right arm, we find that the anesthetist's left hand is free to hold the patient's chin in position and the right hand is free to manipulate the Surital injection or adjust the gas machine as necessary. The venipuncture is done and the needle taped securely in place. The tubing is brought up toward the head, the length of the tubing places the syringe at about shoulder level of the patient, making it very easy to manipulate.

Clinical Uses

This series of cases has been broken down into categories in order that the full picture may be presented. Techniques and specific amounts administered to average cases will be discussed in each type of delivery. Occasionally, a patient may be given a drug that will relax her so completely that delivery occurs more rapidly than had been anticipated. For this reason the record of the patient is checked carefully to determine what kind of drug she had received, the amount, and the time that it was given. We found that most patients who are given any narcotic or tranquilizing drug require far less anesthetic than the ordinary patient. At times we have felt that a

Table 1.

Procedure	Number of cases
Rupture of membranes for induction of labor	25
Caesarean section	89
Frank breech delivery	29
Footling delivery (3 double footling)	10
Primipara, normal with perineal repair	36
Primipara, normal without perineal repair	6
Multipara, normal with perineal repair	357
Multipara, normal without perineal repair	161
Forceps delivery with repair	466
Forceps delivery without repair	24
Podalic version	5

certain few cases have been directly affected by the inhalations of Trilene over a long period of time. For this reason and other reasons, we do not follow any specific plans of administration of Surital, but follow exactly the individual patient's requirements.

In table 1, there is a break-down of 1208 cases in which Surital was used for obstetrical procedures. An "average" patient has been selected from each category to illustrate dosages and techniques.

Induction of Labor

A patient admitted to the hospital for induction of labor or rupture of membranes is prepared for delivery; she is taken to the delivery room at the time the procedure is to be done. She is given 6 cc. of Surital, placed in position and prepared and draped with sterile sheets. Immediately before the actual procedure she is given 3 cc. additional Surital. When a case requires a little longer time than had been anticipated, the patient receives an additional 2 cc. of Surital before the completion of the procedure. With this dosage, the patient reacts by the time she is returned to bed.

Caesarean Section

The patient for Caesarean section is given atropine 1/150th as premedication, approximately one-half hour before surgery. She is advised that the anesthetic works so rapidly that all preparation will be done before she is anesthetized, but she is assured repeatedly that she will be asleep. We realize that the patient is most generally apprehensive and we keep assuring her over and over again that everything will be all right. This we term "vocal anesthesia"! It is usually during the placing of the last sterile drape-sheet that the first Surital is given.

Because there has been no sedation, the patient's requirements for Surital are a bit greater than those of the routine surgical anesthesia patient. We also give a gas mixture consisting of two liters of oxygen, 1 liter of nitrous oxide and 400 cc. of cyclopropane, which is given continuously throughout the operation, with the exhaling valve open. In addition to the use of soda lime, the open valve is an added precaution in eliminating accumulations of carbon dioxide. Almost invariably within 15 to 20 seconds after receiving the first Surital, the patient will breathe deeply two or three times before settling down to smooth, regular breathing.

On very rare occasions, a patient may have a phase of apnea immediately following the initial amount of Surital. This condition has been corrected by administration of oxygen with positive pressure on the breathing bag. The rate and rhythm of respiration usually changes with the depth of anesthesia and/or stimulation of the surgical procedure. As an example, removing the child from the uterus or clamping the peritoneum for closure, often stimulates respiration. With experience one learns to anticipate these events and extra amounts of Surital are given immediately before such stimulation occurs. If the patient is not sufficiently relaxed, 2 or 3 cc. of d-Tubocurarine (with 3 mg. to a cc.) is given according to the patient's individual requirements.

A normal sized adult patient receives as the initial dosage, 10 cc. of 2½% Surital. After the patient loses consciousness, the face mask is strapped in place. If there is movement of the body when the skin is incised, an additional 3 cc. of Surital is given. Immediately before the

peritoneal opening, an additional 2 cc. of Surital is given. Signs of anesthesia indicate intervals at which additional 2 cc. amounts of Surital are given throughout the procedure. A patient who received these amounts of Surital was given 2 cc., or 6 mg., of d-Tubocurarine intravenously for improved relaxation. The baby was delivered within 3 minutes after the incision—and there was a spontaneous lusty cry.

Babies are routinely held head down, with mouth mucous being aspirated with a rubber bulb syringe, the cord clamped and severed. After delivery of the baby, the patient receives 100 mg. of Demerol in addition to the Pitocin and Ergotrate. The uterus is closed in layers and, immediately before peritoneal closure, 3 cc. of Surital is given to compensate for the stimulation generally encountered when peritoneal edges are clamped with forceps and some tension is applied. After closure of the fascia, the cyclopropane is discontinued and the patient is carried on nitrous oxide and oxygen for the completion of the surgery. This patient is reacting on return to bed. The actual anesthesia time in a typical case, is 32 minutes. The total amount of Surital given is 26 cc. Before the baby is born, 15 cc. is given; during the surgical procedure, 8 cc.; and the additional 3 cc. is given before closure of the peritoneum. The total amount of d-Tubocurarine is 6 mg. These dosages fluctuate with individual patients.

There have been three patients brought to surgery for Caesarean section who were having severe convulsions. This type of patient is anesthetized immediately, before any preparation is attempted. Three cc. of Tubocurarine is given for relaxation. The gas-oxygen mixture is started with the oxygen content being increased to 4 liters instead of the usual 2 liters. One child was stillborn and evidently had been dead for some time; the other two babies were living. The anesthesia of these cases was continued in the same manner as the typical case.

Transverse Position

An unusually difficult case was that of a gravida three, with the baby in a true transverse position. This patient had been in labor several hours without any progress. The doctors decided to do a podalic version and wanted her deeply relaxed. She was anesthetized with Surital, given nitrous oxide and oxygen, and 3 cc. of Tubocurarine. An examination revealed that she also had a contraction of Bandl's ring. In a short time the ring relaxed but the baby was so large and so tightly wedged that they worked for 30 minutes. The patient received an additional 1 cc. of Tubocurarine 30 minutes after the first was given. A cervical tear caused bleeding so extensive that the doctors called for an immediate Caesarean section and within a matter of minutes the abdomen was open. The time elapsed from the first administration of Surital to the delivery of the child was exactly 45 minutes. The baby had a mouthful of mucous but was not dark in color; the pulse was good but the baby was flaccid. The mucous was suctioned from the throat. the baby held upside down and the chest compressed somewhat to relieve any further stress of airway. The resuscitator was used a very few minutes and the baby began to breathe on its own so that the resuscitator was shut off and oxygen was given. Alpha Lobelin 1 cc. was given

immediately on delivery, but no other medication was given. The oxygen was continued and 20 minutes after delivery the baby squalled lustily! This baby weighed 10 lbs., 9½ ozs., and 10 days later was discharged with its mother, both in good condition.

Multipara

This next type of case for discussion is a multipara who will have a normal delivery. She is a gravida five. She has had hard bearing-down pains every minute or minute-and-a-half. A venipuncture was done and 3 cc. of Surital was given. Nitrous oxide and oxygen, (50-50) was given at the same time as the Surital. The patient was prepared for delivery. She became well relaxed but within two minutes' time had another hard contraction. She was given 1 cc. of Surital with each contraction until the head was being delivered, when she was again given 3 cc. She was given 1 cc. of Surital immediately before delivery of the placenta and required no further anesthesia. She was awake on return to bed. She remembered nothing of her delivery and was very enthusiastic about the procedure. This is the story we have repeated time after time: The enthusiasm of these patients.

Episiotomy and Repair

Several multiparas, delivering normally, have had repair work done or have had episiotomies and repair. For a multipara who will have an episiotomy, her doctor may prefer to have the perineum bulging before he performs the episiotomy. The patient is given 4 cc. of Surital and the episiotomy is done during a contraction, with the perineum bulging. After the baby is delivered, the repair work is completed by giving intermittent dosages of 2 cc. of Surital when necessary, with the usual combination of nitrous oxide and oxygen. Should a patient relax so completely with the 4 cc. of Surital during episiotomy and not deliver on this contraction, the rapid elimination of Surital will invariably result in delivery after the next contraction.

Breech

The patient with the baby in frank breech position is given nitrous oxide ⅓ and oxygen ⅔ with contractions until the presenting part of the baby is visible. This patient is then given 2 cc. of Surital during a contraction; the nitrous oxide and oxygen being continued. As the presenting part is delivered and the doctor is able to maintain a good hold on the buttocks of the baby, the patient is given 3 cc. of Surital and delivery is completed. We do feel that frank breech deliveries are more easily accomplished because the patients are better relaxed with the combination of Surital and gas anesthesia.

Footlings

The footling delivery is accomplished in much the same manner as the frank breech. The patient is anesthetized at the time the doctor wishes to deliver the baby. The patient is given 6 cc. of Surital and the nitrous oxide-oxygen combination. Relaxation being satisfactory, the baby is readily delivered. At the time of placental delivery, the patient is given an additional 2 cc. of Surital.

Primiparae

Normal delivery of primiparous patients, totaling 36, in our series was a bit unusual. The patient is given nitrous oxide-oxygen during contractions until such time as delivery is imminent. During hard, bearing-down contractions, the patient is given 2 cc. of Surital for the

initial dosage, and 1 cc. with each contraction thereafter until such time as she is delivered. At the time of actual delivery, some of these patients were managed with episiotomy done with the perineum bulging. A few of these patients received small lacerations which required some suturing, but 6 additional patients delivered their first babies normally and without any lacerations. We feel that this was due to the fact that so many patients relax much more readily than with the gas-ether type of anesthesia.

Forceps Delivery

There are 24 patients who were delivered with forceps, but required no repair. Some of these patients were multiparas who might have delivered normally had it not been for some unusual physical condition, such as cystocele and rectocele blocking the progress of delivery. Occasionally we have had an uncooperative patient who will not bear down to aid the delivery, or a patient who, even though she has had several previous deliveries, becomes hysterical and is unable to help herself. The easiest way to deal with this type of patient is to administer 5 cc. of Surital, apply forceps, and deliver the baby very easily. At the time the placenta is delivered this patient receives an additional 2 cc. of Surital.

The group representing the largest number of patients in this entire series is the one in which a forceps delivery is done, and episiotomy and repair. Unless there is a drastic reason for doing a mid-forceps delivery, application of low forceps is the accepted procedure. One typical patient was given nitrous oxide and oxygen analgesia with contractions, until the obstetrician indicated that actual delivery was about to occur. Six cc. of Surital was given, and nitrous oxide-oxygen given continuously throughout until the procedure was completed. Application of the forceps was made and intermittent traction applied until the head was ready for delivery. At this time an additional 3 cc. of Surital was given; episiotomy and delivery were accomplished easily. The baby cried spontaneously and lustily. The placenta was delivered, a vaginal tampon inserted and the repair done in the usual manner. The patient received Surital in amounts of 2 cc. when signs of anesthesia indicated the need.

The signs of lightening anesthesia that we note most frequently are an increase in the rate and the depth of respiration and an acceleration of the pulse rate. The total time for this delivery and repair was 22 minutes. The total amount of Surital required was 18 cc. The skin closure required deeper anesthesia — whether it was subcuticular or through — and — through suturing. A few patients have moved some part of the body when skin suturing was started but were rapidly controlled by an additional 2 cc. of Surital. The average time requirements for clamping, severing and tying the cord and for checking the baby is approximately 2 to 3 minutes. The majority of this series of patients has been ready for delivery of the placenta in about 2½ to 3 minutes' time. The placenta is easily expressed by a gentle Crede.

Podalic Version

The patient who requires version of the fetus, should be well relaxed. Under the most favorable conditions, the podalic version is difficult because of the manipulation of the fetus into a position where it may be delivered as a footling. There is tremendous

pressure on the obstetrician's hands —many times causing him to use one hand for a while until it becomes numb, and alternating to the other hand. One patient for podalic version had a shoulder presentation and a Bandl ring contraction. The initial amount of Surital was 6 cc. d-Tubocurarine 3 cc., or 9 mg. was given to assist relaxation. At the same time an additional 3 cc. of Surital were given. After this Surital was given in 2 cc. amounts as necessary. The version was a difficult one to complete. Twenty minutes after the first Tubocurarine had been given, an additional 1 cc. was given to facilitate extraction of the fetus. There was a first degree laceration which was repaired. The baby's color was a bit dusky and the baby required suctioning of large amounts of bloody mucous from the nose and throat. It was given oxygen until the color was good and was in good condition on admission to the nursery. The total time for the version, delivery and repair was 40 minutes. The d-Tubocurarine given was 4 cc., or 12 mg.; the Surital given was 32 cc.

The delivery of twins is accomplished in exactly the same manner as for single births, using Surital and nitrous oxide-oxygen. Because of the rapidity with which the patient reacts after receiving Surital, in the normal case it will be a very short time before contractions will be resumed and the second child delivered. One patient about to deliver twins required an episiotomy; 4 cc. of Surital was given and the episiotomy was done. The baby was delivered normally and within 3 minutes' time the contractions occurred and the second twin was delivered. At the time of delivery of the second twin, an additional 3 cc. of Surital was given. During the repair of the episiotomy, Surital was given in 2 cc. amounts when it was required.

Advantages

The advantages of Surital in obstetrical work are many: (1) No ether is needed. (2) We feel that we have better control of the patient at all times. A light plane of anesthesia is produced during contractions, and the depth is readily increased for episiotomy or for forcep deliveries. We have found that this can be accomplished in a much shorter period of time than was possible with gas and ether. (3) Induction is rapid. Within 15 to 30 seconds the patient is unconscious and relaxed. (4) There is no excitement stage. (5) Amnesia is good; many of the patients do not remember the venipuncture. (6) The patients are usually well relaxed; the number of patients who do require unusually large doses of drugs for relaxation compares favorably with the number who failed to relax with ordinary gas-ether anesthesia. (7) Higher percentages of oxygen with the gas mixture than are usual with other technics are an advantage to both mother and baby. (8) The total amount of anesthesia has been much less than previously required. The entire staff in the obstetrical service agree that the babies are crying more promptly and have lustier cries than we had observed before. Particular attention was paid the babies response, and accurate records were kept because we were concerned particularly with the effect of the barbiturate on the baby. (9) Nausea and vomiting were decreased. In the past, many patients vomited during induction of anesthesia. In this series, we have had only three pa-

tients who vomited after Surital induction.

There has been a notable decrease in the incidence of post-partum nausea and vomiting. (10) The patient requires less nursing care immediately post-partum because she reacts more rapidly after having received Surital and gas combination than with previous types of anesthesia and there is less nausea or vomiting. (11) The patients are most enthusiastic—and especially grateful are those who can make comparison with a previous delivery in which any other type of anesthesia was used.

Discussion:
Dr. William M. Thornburg*

My association with Mrs. Norbeth Koonce and Miss Susannah Poole in this report, has been in the capacity of Chief of Obstetrical Service during this service. Mrs. Koonce has asked that I give some of my impressions of obstetrical work with the use of Surital. I should like to give, then, certain extemporaneous comments—viewed, more or less, from the opposite end of the table!

First of all, I am convinced that Surital is a safe drug to use—both from the standpoint of the infant and from the standpoint of the mother.

Our babies have a prompt respiration and cry; in the main, their color is good and they are reacting vigorously. Hence, we believe that the time element in the use of Surital in the usual routine of delivery is not a factor. Surital is administered and I do not feel that I am under any hurry to have this baby delivered.

My experience in using Surital in the primiparous patient has been good. I routinely use outlet forceps and episiotomy and repair. The Surital is administered at the time of completion of dilation when the baby's head is on the perineal floor and I am ready to make my forceps' application. My patients are uniformly relaxed and ready for any obstetrical procedure that is required and any surgical repair of the perineum following delivery. Often during the period of time that I am waiting at the other end of the table it has been necessary to give this patient a little Surital prior to the time of application of forceps. This will usually induce enough relaxation and control of the patient, but apparently does not slow or abolish the uterine contraction. This has been particularly noticeable in delivery of multiparous patients. I am often able to complete delivery with the mother's uterine contractions and Ritgen's maneuver. I am particularly impressed with the rapidity with which this drug relaxes our patients and I am also pleased with the way the patient reacts after the delivery is completed. The short-acting character of Surital, I think, from this standpoint, is well adapted for use here in a small hospital.

Mrs. Koonce, earlier in this report, also has mentioned the fact that the third stage of labor is usually completed in 2½ to 3 minutes following the delivery of the child. Following delivery, too, there is a good tone of the uterus—it very promptly contracts down and we have had no hemorrhages attributed to the use of this particular anesthetic agent. Our patients are rarely nauseated from this agent. Usually during induction of anesthesia with other preparations, there is quite a factor of having the patient vomit on the table. This has been conspicuous by its absence while

*Marshall-Browning Hospital, DuQuoin, Illinois

we have been using Surital. Our mothers here like Surital; they like the amnesia that is induced—the freedom from nausea—the fact that they are awake and able to see their babies shortly after they are delivered. This has been quite a factor in removing fear of childbirth—and a method of building confidence in these women.

Our use of Surital in Caesarean sections has been very accurately and adequately described by Mrs. Koonce. We have used it now for some time, and I believe it just as safe here as in our delivery room. I feel that I am under no stress or hurry to get the abdomen opened—the uteri have contracted down normally following Caesarean section and the babies have been awake with a prompt respiration and cry—their colors have uniformly been good.

I think perhaps I can sum this up by saying that we believe that Surital is safe for babies and for our mothers—that it is quick in its action, has a short duration of action and is very rapidly excreted. It is easy to administer and requires no elaborate set-up. It is well adapted to handling of routine obstetrical procedure and also is very adaptable to use in operative procedures and in handling other complications of delivery. It is a safe drug to use in the toxemias of pregnancy that are complicated by convulsive seizures. Its short action is well adapted to use in producing relaxation for Caesarean section. It has been one of the good agents that has come out in the last few years and definitely has a place in obstetrics.

Use of Pentothal in Children

H. K. Sowell, M.D.*
Oklahoma City, Oklahoma

Premedication with a narcotic and with atropine is basic, and essential. Children deserve a preoperative tranquilizer even more than do adults. I have slowly eliminated codeine, barbiturates, scopolamine, oral and rectal medications, and have come to rely almost entirely upon Demerol and atropine.

Demerol medication begins with 25 mg., 45 minutes prior to surgery, at 18 months, increases to 30 mg. at two years; add 5 mg. for each year thereafter through 12 years. The 15 year old patient usually can take adult dosage easily. I have never had a child over-sedated on this schedule—instead, almost all children arrive in the surgical area alert, calm and cooperative.

I have selected Demerol for several reasons — first, the floor nurse will usually give Demerol in "large" doses without too much reluctance, and second, Demerol gives excellent psychic sedation without much physical sedation. I have discarded scopolamine because of the postoperative agitation that minimal pain evinces during this drug's activity. Pain can cause enough agitation without the "benefit" of scopolamine.

Atropine below gr. 1/350 has so little drying action that I believe such dosage should be omitted entirely. I use gr. 1/350 by age 12 months through 3 years, gr. 1/300 at 4 years, and gr. 1/200 5, through 12 years—then increase to gr. 1/150.

When the child arrives in surgery, a glance will usually indicate the advisability of starting the anesthesia with a needle or, such a question as "did you cry when you got your shot this morning?", will give a lead. If a Pentothal induction seems destined to be preceded by a struggle, then abandon a venipuncture until after the patient is asleep. Begin the induction with N_2O-O_2, 20 liters to 5 liters insufflation, after permitting the child to listen to the rush of "air" through the end of the breathing tube. After a couple of minutes of calm conversation, the mask can be attached and gently lowered to the face. About half of the children will now require a closed system with minimal cyclopropane for the venipuncture. Immediately after introduction of Pentothal, return to a semi-open system, with not less than 2 liters of nitrous oxide to 1 liter of oxygen. Six liters of nitrous oxide with 3 liters of oxygen in the very young is a safer flow rate.

Succinylcholine chloride should be dripped at the required rate to estab-

* Anesthesiology Associates, 620 N.W. 9th, Oklahoma City, Okla.
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lish the needed relaxation. This permits an incision to be made with only an amnesic dose of Pentothal. Thus, the patient can be returned to his room moderately alert and in full control of the respiratory apparatus. Curare is not a good agent for short procedures.

This technique, as applied to tonsillectomy, gives remarkable control. The succinylcholine chloride drip with one gram of drug in 500 cc. of solution can be increased at the first sign of muscular activity in the oropharynx, then quickly reduced to the proper level. After operation remove the orotracheal tube before return of muscular activity, aspirate the pharynx, and give oxygen until the patient is breathing. The needle should be left in place until normal breathing has returned since laryngospasm may occur. The endotracheal tube is removed early to minimize the occurrence of laryngospasm.

Pentothal dosage varies from 100 mg. to 200 mg. for patients up to about 10 years of age and is increased up to 400 mg. for an adult tonsillectomy. Pentothal is not an anesthetic agent, and should be used for amnesia only.

The venipuncture needle in children 10 years of age and under should not exceed 23 gauge and should be short and sharp. The needle is much more important than the person wielding it. The size of the needle helps to avoid excessive dosage of the relaxant.

Naturally, there are times when a venipuncture cannot be accomplished. Intramuscular succinylcholine chloride, 40 to 60 mg., with vigorous massage, a short interval of cyclopropane administration, and an easy intubation can be done. Cyclopropane can be continued, if the soda lime is fresh, and if assisted respiration is carried out.

A closed system with children is not accepted by most people in anesthesiology, but it is entirely safe, even for long periods, if good ventilation is assured and if a large absorbent canister is used.

In order to have a patient recover from anesthesia calmly, he must awaken without pain, as well as without scopolamine. The immediate recovery of the tonsillectomy patient with this method will give you valuable insight into his need for a postoperative narcotic. If he is trying to sit up and/or fretting in the operating room, then an immediate intramuscular injection of Demerol approximating the preoperative dose is excellent treatment. Vigorous massage of the site of injection will give sedation within five minutes.

In long procedures, sweating of the forehead will indicate the need for intravenous Demerol. The sweating does not signify carbon dioxide retention but is an indication of light anesthesia. It is not necessary to keep the patient entirely dry — judge the Demerol dosage on a basis of his preoperative reaction to sedation, giving increments of 10 to 15 mg. at a time, directly into the succinylcholine drip or the fluid drip.

This technique has been developed over a period of some twelve years. By 1947 I refused to accept the age-old dictum that ether was the safest anesthetic for children and have actively promoted Pentothal - nitrous oxide, with a decreasing emphasis on Pentothal.

Monitoring in Anesthesia

C. G. Yarbrough, M.D.*

Dallas, Texas

When a patient is a candidate for anesthesia the anesthetist must avail herself of as much information about his physiological status as she can, and then with the beginning of anesthesia relate the changes which occur to continuous functions of the patient. We do this by the use of our senses and what information, intermittent or continuous, instruments can relay to us. This is monitoring. Monitoring, as used in anesthesia, is to keep us informed about particular body processes; are they functioning as they should or do they foretell of complications or disaster?

The monitoring of anesthesia does not replace the anesthetist but just adds to the accuracy of knowing what is happening to our patient. This is not a substitute for good anesthesia, but helps us to maybe do a better job. Remember, these must be aids to our job of anesthesia so that surgery may be performed. If we do not know how to use them, or if they occupy too much time away from the patient, or the patient is forgotten, the instruments used are not monitors but just gadgets.

Often the anesthetists are given equipment to use which they do not know about, and in the maze the patient is neglected. Use one new type of monitor until you are familiar with it before adding another one. Monitors should be purchased by those who are to use them, and then their application to the patient during anesthesia should be really studied.

A few years ago there was very little done about instruments to monitor anesthesia and the anesthetist had to depend on her senses to try to determine the condition of the patient, but today such instruments are numerous and range from very simple to very complex. The anesthetists must still use their senses for much information about the patient and the monitor information is interpreted by them. Instruments are not always correct. Something may go wrong.

See the patient: Skin condition, color, respirations, action of patient, also monitor information. Sight is probably our most important sense in anesthesia.

Feel or touch: Skin temperature, dryness, pulse. The feel of the bag on the machine tells about respiratory exchange.

Hear: Sounds in blood pressure determination, evidence of obstruction to airway, and some monitoring devices.

Smell: Not so important but may be used to determine amounts of some anesthetic gases, such as ether or cyclopropane.

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*Chief of Anesthesia, V. A. Hospital, Dallas.

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Monitor use in anesthesia includes: mechanical (heart and pulse beat, muscle tone and movement, movements of respiration); acoustical (heart and chest sounds); temperature (body and skin): pressure (arterial and venous blood pressure, respiratory pressure); light and radiation (dye dilution techniques, or radiation for blood volume and cardiac output, oximetry); electrical (action potentials of heart, brain, nerve or muscle); and physiochemical (blood pH, optical and electrical effects of oxygen and carbon dioxide in inhaled and exhaled air).

The future of monitors looks bright, as the simplification of many we now have is in sight and the new ones are on the horizon. Techniques for continuous monitoring of blood volume and cardiac output are close to realization, as is monitoring of total peripheral resistance. The present monitors are large and bulky, and probably soon most monitors will be very small or micromonitors—remember space is at a premium in the operating room. Already there is a pulse monitor the size of a dime, which sends pulses that are picked up by a receiver about the same size. No wires connect. Think how it would be if there were no maze of tubing or wires.

Monitoring of the cardiovascular system is essential and may be by simple means to take pulse rate or by very complex instruments, such as those used to determine blood volume. The pulse rate should be taken at regular intervals and recorded probably about every five minutes unless there is indication of trouble—then continuous pulse rate and character should be noted. Another easy monitor, and a very useful one, is the blood pressure cuff with stethoscope to record changes in blood pressure that occur during anesthesia. This also should be recorded about every five minutes unless you are warned of impending hypotension, and then to maintain an adequate level if vasopressors are being given. The use of either an aneroid or mercury type monometer is satisfactory since you are using a relative level of blood pressure during the procedure. The pulse and blood pressure are available to all who administer anesthesia and should be used on *all* cases.

Listening to the heart beat by stethoscope is usually available and is especially useful in children, where a precordial stethoscope or an esophageal stethoscope may be used. With these it is usually advisable to use a one-ear molded earpiece, and continuously listen for the heart sounds.

Electrocardiograph (ECG) may be used, and is used much more now than formerly. It gives much useful information about the electric complex that occurs in the heart during its cycle. Many anesthetic agents and conditions the patient may have, may make ECG monitoring necessary. If you do not know ECG fundamentals, you can have someone else keep tab on the ECG. Often an internist is called to keep up with heart changes as manifested by ECG changes. Although you do not know how to read an electrocardiogram, you can soon learn the signs of danger as seen on the ECG. The ECG may be given to the anesthetists by being shown on a screen, oscilloscope, or by writing on paper for permanent record and more careful study. The application of electrodes for the ECG may be made by using regular ECG paste, but this seems to become a poor connector for prolonged cases.

so that in general the use of needles subcutaneously for the leads is much better.

The common term, "cardiac monitor" applies to still another instrument which gives a needle change on a dial or a tone audible by earpiece, or a loud tone that all in the room can hear, with each heart beat. These have been quite popular but their usefulness is limited so better monitors are taking form.

Blood volume determinations are among the more complicated cardiovascular monitors and are not readily available today, although some strides are being made to improve the ease and ready determination of blood volume. The more common basis used is to inject a known amount of radioactive tagged material, and then, by using samples, draw blood and count the amount of radioactivity.

The respiratory system must be monitored during every anesthetic and in this we use the senses most; that is, we watch the rate of the respirations and estimate the amount of exchange of gas that occurs with each respiration. There is now a new emphasis on gas exchange volume and several flowmeters have been developed. A new one looks promising, with a bellows and a gas measure volume which is easily seen and measured. This has become more important to measure since the nearly routine use of relaxants, which definitely decrease the volume exchange of the respiration and cause many patients to become hypoventilated.

Gas analysis may be an important monitor for anesthesia, and is frequently carried out. It is not a routine as yet for it is fairly complicated, often requiring other personnel to do the analysis. The most common gases analyzed are oxygen, carbon dioxide, cyclopropane, and ether vapor. We usually supply above the metabolic requirements of oxygen, but may get in trouble with too little exchange during respiration so that carbon dioxide accumulates. The gases of cyclopropane and ether vapor need to be watched closely, but if the patient is observed and proper care used, these agents will not become too concentrated.

A relatively new and very excellent monitor has become important in anesthesia, and that is the electroencephalograph (EEG). This has been used in Neurology for some years but lately drug effects on the brain have been studied so that anesthesia levels can be determined very accurately. The EEG may be recorded by writing or by the wave of the EEG appearing on the oscilloscope. The written or the scope patterns may be recorded simultaneously with the ECG so that this has given us two important monitors being recorded at the same time. The EEG may be recorded as 2 leads or, if more information is desired, the multichannel machine is used. For each agent used, there is a definite pattern, as is also true for the plane of anesthesia used.

Thermal monitoring is important and can be checked by thermocouple placed in the rectum, the esophagus, or under the skin. Acutely ill patients often are hyperthermic, which may complicate anesthesia. The use of hypothermia for some surgical procedures demands the careful monitoring of temperature.

There are at present two types of Servo-mechanisms to administer the anesthetic agent automatically in an effort to produce an even level of anesthesia. These are the type which use the EEG electrical potential to

trigger more agent to be given, and the other is to use gas analysis and maintain a constant level of gas which tends to an even level of anesthesia. By either of these mechanisms, the level of anesthesia is constant and can be maintained for long periods of time.

These are but a few of the monitors in anesthesia, and only a peep into the possibilities that lie ahead in monitoring of physiological processes of our patients. We must learn to use monitors and they are a great help in keeping us informed about our patients, but don't let them become so burdensome as to cause you to lose contact with your patient. They are aids to good anesthesia, but the correlation of information gained must be done by you, a wide awake, interested anesthetist.

Mechanisms are in use more in anesthesia today so will take more and better anesthetists, and your job is increasing in importance, not getting smaller or getting in such a state that the patient is hooked to a machine for his anesthesia. The monitoring of anesthesia will make us better anesthetists, so keep on your toes.

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Legislation

Emanuel Hayt, LLB., Counsel A.A.N.A.

Liability of Hospital for Failure to Treat Man in Emergency Room

In this action for the wrongful death of John J. O'Neill, who died of a heart attack on the morning of June 29, 1952, the widow sought recovery against a hospital for failure to render necessary emergency treatment, and against a physician for his failure and refusal to treat the deceased.

Briefly, the facts, as they appear in the record, are that the plaintiff awoke shortly before 5 A.M. and saw her husband standing at the window, rubbing his arms and chest. His mouth was open "and he was trying to get as much air as he possibly could." He was perspiring, his face was white as contrasted with his normally ruddy complexion, and he complained of severe pains in his chest and arms. With the assistance of the plaintiff, O'Neill dressed and walked to the hospital, which was three blocks away. He stopped frequently on the way in order to rest and to find a taxicab, but none was available.

It appears that the hospital maintained an emergency room or clinic. When Mr. and Mrs. O'Neill arrived at the hospital the doorman conducted them to the nurse in charge of the emergency room. The plaintiff told the nurse that the deceased was very ill, and was suffering chest and arm pains, and she thought he was having a heart attack, and she requested the services of a doctor. At that point Mr. O'Neill mentioned that they were members of a Hospital Insurance Plan, (hereinafter referred to as HIP). Thereupon the nurse stated that the hospital had no connection with HIP and did not take care of HIP patients. After reflecting for a minute or two the nurse stated, "I'll try and get you a HIP doctor," and then telephoned the defendant Graig, telling him that the deceased was in the emergency room of the hospital, complaining of the pains hereinbefore described. She then handed the telephone to Mr. O'Neill, who described his pains to Dr. Graig, and then, after a pause, stated, "Dr. Kirstein." After another pause Mr. O'Neill said, "Well I could be dead by 8 o'clock." When the deceased concluded the telephone conversation he informed the nurse that Dr. Graig had told him to go home and come back when HIP was open. Mrs. O'Neill, however, asked the nurse to have a doctor examine her husband, since it was an emergency. Disregarding the request, the nurse told her that their family doctor would see Mr. O'Neill at 8 o'clock, to which he again replied, "I could be dead by 8 o'clock."

When examination or treatment at the hospital was refused, the plaintiff and deceased left and returned home on foot, pausing occasionally to per-

mit him to catch his breath. After they arrived at their apartment, and as the plaintiff was helping her husband to disrobe, he fell to the floor and died before any medical attention could be obtained.

In so far as the cause of action against Dr. Graig is concerned, the proof indicates and the court found that the plaintiff and her husband were members of the Montefiore Group of HIP. Two of the doctors composing that group and, under contract with HIP to treat its members, were Doctors Kirstein and Graig, the former being the physician ordinarily consulted by the O'Neills, while the latter was the doctor on call on the morning in question.

Dr. Graig confirmed Mrs. O'Neill's testimony that he received a phone call from the Montefiore Hospital emergency room and spoke to the deceased. Dr. Graig testified in some detail concerning that conversation and related the inquiries he made concerning symptoms, prior episodes, electrocardiograms and other items of the patient's medical history. He then went on to state that he offered to come to the emergency room and make an examination, but Mr. O'Neill declined, stating that he felt better and would prefer to wait to see Dr. Kirstein, who would be available at 8.

We are not called upon to decide whether, by his contract with HIP, Dr. Graig assumed to examine and treat the deceased and failed to do so as distinguished from whether he, defendant Graig, independently undertook or assumed to examine and treat and failed to exercise due care in so doing. Perhaps a more complete development of the facts in that regard might have been desirable. Thus, whether, as the plaintiff claimed, there was an abandonment of the patient by the doctor, or as the defendant claimed there was a refusal to accept a profferred examination presents a question of fact which should have been submitted to the jury.

However, from the proof in the record we must hold that the jury could have concluded that Dr. Graig undertook to diagnose the ailments of the deceased and could have decided whether he abandoned the patient, inadequately or improperly advised him, or, conversely, made a proper diagnosis fully appropriate under the circumstances, or offered an examination which was rejected.

In this case the plaintiff's proof was prima facie sufficient to permit, but not to mandate the inference that the nurse in charge of the emergency ward undertook to provide medical attention for the deceased. In sum, this was a question of fact for the jury. It was error, therefore, to dismiss the case against the hospital at the close of the plaintiff's case. Whether there was a reasonable fulfillment of any obligation undertaken is a matter of defense and a determination of that issue is for the jury.

McNally, J. (concurring and dissenting) — I concur in the order for reversal and for a new trial as against defendant Frank Graig. I dissent and vote to affirm the dismissal of the complaint against defendant Montefiore Hospital. Through the efforts of the hospital's nurse, the decedent had been enabled to communicate by telephone with Dr. Graig, who had knowledge of the decedent's presence at the hospital. Dr. Graig did not indicate in any manner that emergency treatment was required nor did he direct or request the admittance of the decedent as a patient to the hos-

pital. Any action by the nurse contrariwise would not have been in keeping with her position. It is my view that the conduct of the nurse was by way of favor and I fail to see any legal basis for liability on the part of the hospital.

(O'Neill v. Montefiore Hospital et ano., App. Div., *1st* Dept., N. Y. L. J., July 28, 1960 [front page].)

Liability Imposed for Death of Patient Caused by Transfusion of Blood Intended for Another

During the course of a delicate and complicated procedure upon decedent, the surgeon, defendant Pulrang, was told by the anesthetist that the latter had the patient's blood ready. The anesthetist asked, "Shall I give it?" The surgeon responded in the affirmative. The circulating nurse had come into the operating room with a bottle of blood on which there was a slip inscribed with the name of the patient, type of blood and the name of doctor. The slip showed that the blood was for another patient, previously operated on, not by defendant Pulrang, at which operation, however, the circulating nurse and anesthetist also had been present.

This information on the slip was entirely different from the facts with respect to decedent. Yet the registered nurse turned the bottle over to the anesthetist, implying that the blood was intended for decedent. The anesthetist had a chart showing the type of blood of decedent. He testified that it was his duty to check the blood and that a surgeon does not check blood. He, the anesthetist, did not perform that duty.

Neither the anesthetist nor the circulating nurse was sterile. There is a shield between the anesthetist and the surgeon. To double-check the bottle the surgeon would have been required, not merely to divert his concentration from the serious task at hand, but actually to abandon the patient by leaving the sterile field. As the anesthetist testified, the surgeon does not check blood; that is the function of the anesthetist.

The majority opinion of the Court affirmed the judgment against the hospital, anesthetist and surgeon and reduced the amount from $130,000.00 to $90,000.00. The dissenting opinion held that there was no proof of malpractice on the part of the surgeon. He had the right to rely upon the competency of the anesthetist and the hospital staff.

(Weiss v. Pulrang, App. Div., 2d Dept., N.Y.L.J., July 21, 1960. p. 6 col. 4.)

Hospital Safety

Harriet L. Aberg, C.R.N.A.

What is the isolated transformer and ungrounded electrical circuit about?

N. F. P. A. #56, Code for Use of Flammable Anesthetics, says, "An ungrounded electrical distribution system is — intended to reduce the possibility of electric shocks and recurring arcs and sparks in the event of insulation failure of the electrical wiring system in anesthetizing locations." This is not the same thing as preventing static sparks where a "conductive floor serves as a convenient means of electrically connecting persons and objects together to prevent the accumulation of electrostatic charges."

In preventing static sparks by the use of an electrically conductive floor and conductive soled shoes as well as conductive furniture and other objects, it should be remembered that, "The conductive floor produces a definite shock hazard in the absence of an ungrounded electrical system. The isolating transformers shall be installed simultaneously with or prior to the installation of the conductive floor."

With a properly maintained floor and conductive shoes, there will be a small amount of electrical resistance to shock from an appliance with poor wiring, but to depend on this indefinite, minimal resistance is not safe practice. It is entirely possible that a surgeon or nurse will sustain a definite sensation or shock on touching a defective piece of electrical equipment such as a bone saw, dermatome, portable standing light, or suction machine. The sheath, housing or exterior of such equipment must be insulated from the wiring part of the equipment and this exterior should be grounded. Where a defect in the wiring allows accidental grounding through a bare wire touching some part of a conduit or the housing of equipment, a spark could also be formed. To protect patients, surgeons, nurses and all personnel in the area, against such shocks and sparks, an isolated ungrounded electrical circuit is imperative.

When isolating transformers are installed to provide ungrounded electrical current, a detection system is included in the wiring. This will detect any fault to ground on equipment plugged in to this system. "When the ground contact signal (red light) lights and/or the audible warning sounds, the administration of flammable anesthetic agents shall be discontinued at the earliest possible moment. Following the completion of the operation the operating room in which the signal functioned shall not be used until a report has been received from the Engineering Department that the electrical defect has been remedied," says N. F. P. A. #56.

Miss Aberg is A.A.N.A.'s representative on the N.F.P.A. Committee on Hospital Operating Rooms.

Any questions pertaining to hospital safety may be directed to the Executive Office. Answers will be included in this section in future issues.

Insurance

Professional and Personal Liability Report

The Professional and Personal Liability annual report was made to the Board of Trustees at the AANA Convention in San Francisco.

The number of members involved in various types of incidents has increased. However, this increase in incidents is principally due to the larger number of members enrolled.

The Professional and Personal Liability program was officially adopted by the AANA in September of 1955. This excellent program has proven a valuable plan over the past five years. We believe its principal asset is in the fact that we have never received a serious complaint from any member in regards to service. Incidents have occurred in practically every State in the Union and the service to the members in time of needed help has always been ready. This peace of mind is important to members engaged in the delicate art of anesthesia.

Important, also, are the claim files that have accumulated interesting facts over the past five years. Perhaps too, in the files are to be found some lessons on "what not to do" as well as "what to do". The faults of omissions are as deadly as the faults of commissions. The AANA has an unusual record of real or alleged negligence that should some day be of educational value.

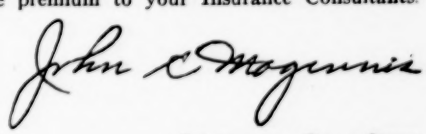
And here is the high point of the five year history. NO MEMBER HAS EVER HAD TO APPEAR IN COURT. As a principal witness in a liability suit an AANA member not only would lose considerable time from work, but would also be subjected to the usual expert cross-examining of attorneys. This could be a real rough experience. Good claim service and expert legal help have been responsible for this five year record.

Over the years practically every type of claim involving anesthesia has appeared. From the small nick of a surgical scissors to the horror of an operating room explosion. And each case was handled satisfactorily through the AANA Professional and Personal Liability Program. Many claims on Personal Liability were also serviced. These claims too, were handled in the best interest of the members. The combination of Professional plus Personal Liability has proven a valuable asset to our "financial security program".

As a reminder, allow me to repeat; only AANA members in good standing and AANA student members in good standing are eligible to enroll in the Professional and Personal Liability Program.

In the event of a possible claim, write direct to your insurance consultants, giving the following information. Name of the patient or the claimant and the proper address. The name and address of the hospital where the incident occurred. Give the date and all information pertinent to the incident. This information is forwarded on to the insurance company and they will write to you recognizing the receipt of this claim.

An opportunity to enroll in your AANA Professional and Personal Liability Program is now available. Details and enrollment applications are found on page 302. Complete the application and forward it along with the premium to your Insurance Consultants.



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Book Reviews

General Anaesthesia. Volume 1: Basic Principles. Volume 2: Techniques, Special Fields and Hazards. Edited by Frankis T. Evans, M.B., B.S., F.F.A.R.C.S., D.A., Anaesthetist, St. Bartholomew's Hospital, St. Mark's Hospital for Rectal Disease, and Royal Masonic Hospital, London, and Cecil Gray, M.D., F.F.A.R.C.S., D.A.; Professor of Anaesthesia, University of Liverpool. Butterworth & Co. (Publishers) Ltd., London. Cloth. Vol. 1, 531 pages; Vol. 2, 431 pages, illustrations. Index duplicated in both volumes. 1959. $29.50.

This two-part book, designed for study and for reference, comprehensively covers a wide range of subjects. Each chapter is prepared as a monograph by the authors who have contributed to the book. The chapters follow each other in logical sequence and are not divided according to the author. In volume 1, special aspects of fundamental concepts are treated by such authors as A. J. W. Beard, M. H. Armstrong Davis, John W. Dundee and William W. Mushin, as well as eleven others who are equally outstanding authorities.

The second volume, also written by many authorities, is devoted to technics, hazards of anesthesia, and special fields. The special subjects are not restricted to actual surgical anesthesia but also cover such wide areas as principles of diagnosis of congenital heart disease to oxygen therapy.

References follow each chapter. In some instances this list of references is extensive. Illustrations and diagrams are well reproduced. Each volume is indexed.

Basic Facts of Body Water and Ions. By Stewart M. Brooks, M.S., Science Instructor, Lasell Junior College, Auburndale, Mass.; Instructor in Pharmacology at Boston City Hospital School of Nursing, and Children's Hospital School of Nursing, Boston, Mass. Springer Publishing Company, Inc., New York. Paper. 159 pages. 1960. $2.75.

The author has taken the basic facts from the latest research papers and standard works, and organized them into a clearly developed book for use by nurses and others interested in this relatively new subject.

Facts about body water, electrolytes, acid base balance and other data make up the first part of the book. Practical application of the information comprise the second part of the book.

Part three is a glossary. A list of references follows the glossary. Indexed.

A Dictionary for Medical Secretaries. By Isabel Alice Stanton, Secretary, Director of Graduate Training, Baylor University College of Dentistry; formerly Supervisor, Baylor Hospital Central Dictating Unit; Secretary, Coordinator of Internal Medicine, Division of Graduate Medicine, University of California, Los Angeles. Charles C Thomas, Publisher, Springfield. Cloth. 175 pages. 1960. $6.50.

Prepared for medical secretaries by a medical secretary, this dictionary may be found useful by others working with medical terms. Laboratory tests and terms are defined briefly,

(Continued on page 312)

Abstracts

Nelson, R. M.: 'Tranquilization' of the heart with the ataractic drugs. J. Thoracic & Cardiovascular Surg. 38: 610-617 (Nov.) 1959.

"With the observation in our laboratory that certain antihistaminic and ataractic (tranquilizer) drugs apparently exert a stabilizing or 'tranquilizing' effect on the heart, and in view of reports in the literature suggesting clinical usefulness of certain ataractic drugs in cardiac arrhythmias, this study was begun to see if the ataractic drugs could convert ventricular fibrillation into a normal sinus rhythm. Subsequently questions were raised regarding the possible effects of these drugs on the normally beating heart, and if any protection might be afforded against the occurrence of ventricular fibrillation. . . . An isolated canine heart, biologically supported by a donor dog, was utilized as the preparation for study. . . .

"This report concerns forty-two experiments which were performed after the techniques and protocol were standardized. The following drugs have been studied: hydroxyzine (Atarax) in 15 experiments, prochlorperazine (Compazine) in 4, promethazine (Phenergan) in 2, reserpine (Serpasil) in 1, promazine (Sparine) in 1, trifluoperazine (Stelazine) in 8, chlorpromazine (Thorazine) in 2, perphenazine (Trilafon) in 5, and, for comparison, quinidine. . . .

"Under conditions of these experiments, employing the biologically supported isolated canine heart preparation, infusion of an ataractic drug into the coronary circulation is capable of converting ventricular fibrillation into a normal sinus rhythm. In the majority of instances, residual protection follows the administration of an ataractic drug against the artificial production of ventricular fibrillation by repeated low-voltage shocks. These drugs are quite similar to quinidine in the direct effect on the rhythm of the canine heart."

Carson, J. S., Harkness, T. T., Hampton, L. J. and Chase, H. F.: Clinical experiences with fluothane, a new nonexplosive anesthetic. Ann. Surg. 149: 100-106 (Jan.) 1959.

"It is the purpose of this paper to describe clinical experiences with this agent as the principal anesthetic agent for 500 surgical procedures. . . . Fluothane can be given with a wide variety of other agents and can be administered in many ways. . . . The usual preoperative medication for these patients was 50 mg. to 100 mg. of meperidine, or a comparable dose of morphine, and either atropine or scopolamine given one-half to one hour preceding induction of anesthesia. . . . Maintenance of a constant plane of anesthesia requires considerable attention and care as the potency of Fluothane is such that changes in depth of anesthesia can occur with great rapidity. . . .

"In our hands one of the main drawbacks of Fluothane proved to be

hypotension during induction. . . . There were two cardiac arrests in this series and no fatalities. . . . Fluothane is a potent respiratory depressant particularly in deeper planes of anesthesia. . . . We have been impressed clinically with the ease with which Fluothane is tolerated by the asthmatic. . . . Good muscle relaxation even for upper abdominal operations can be obtained with Fluothane alone. However, as the degree of relaxation appears to vary with the depth of anesthesia, sufficient depth necessary for production of relaxation, especially in upper abdominal surgery, usually is accompanied by a pronounced fall in blood pressure as well as respiratory depression. . . . We have been impressed with the lack of secretions in patients receiving Fluothane and have felt that these patients usually awaken more rapidly than comparable cases anesthetized by conventional agents."

Ansbro, F. P., Blundell, A. E., Furlong, R. E., Pillion, J. W. and Bodell, Benson: Chloroprocaine (Nesacaine)—its relative nontoxicity as demonstrated by epidural anesthesia. A.M.A. Arch. Surg. 78: 75-78 (Jan.) 1959.

"Chloroprocaine (Nesacaine) . . . is procaine with an atom of chlorine substituted on the second carbon of the benzene ring of the molecule. . . . We investigated chloroprocaine on the recommendation of Foldes, and we are now convinced of its excellent properties. We have used it in 2,000 cases of epidural block and have had only one reaction manifested by a convulsion following injection of the solution. The convulsion was easily controlled by a small amount of thiobarbiturate. Chloroprocaine is at present the best agent we have used."

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Hamelberg, William, Siddall, John and Claassen, Leon: Perforation of dura by a plastic catheter during continuous caudal anesthesia. A.M.A. Arch. Surg. 78: 357-358 (Feb.) 1959.

"Occasional perforation of the dura is a well-recognized possibility following the insertion of a needle into the caudal canal. Perforation of the dura by a plastic catheter passed through a needle in the caudal canal is rare. . . .

"A 60-year-old man was admitted for elective repair of bilateral inguinal hernia. . . . An 18-gauge thin-walled caudal needle was inserted into the caudal canal without difficulty. After aspiration to ascertain that the point of the needle was neither in a blood vessel nor in the subarachnoid space, a test dose of 4 cc. of 1% lidocaine (Xylocaine) hydrochloride U.S.P. was injected. No evidence of spinal anesthesia resulted from the test dose, and a plastic catheter was introduced through the needle to a point 4 cm. beyond the end of the needle. The end of the catheter was blunt. After the catheter was secured, 10 cc. of 1% lidocaine hydrochloride was injected. Profound anesthesia up to the umbilicus developed in less than one minute. . . .

"Thirty minutes after the first dose, an additional 10 cc. of lidocaine hydrochloride was given. Immediately after the second dose, the blood pressure fell to 90/60, and the patient became cyanotic. Because of the patient's impaired cardiac status, this level of blood pressure was considered inadequate. The patient promptly responded to treatment. . . .

"After operation, clear fluid was noted to be accumulating in the syringe attached to the catheter. This was believed to be spinal fluid, and the finding of 10 mg. % protein in the fluid tended to verify this belief. To identify the location of the catheter more accurately, 1 cc. of iophendylate (Pantopaque) was injected through it under fluoroscopy. The dye was noticed to move freely in the spinal fluid. This finding confirmed the impression that the catheter was in the subarachnoid space. The patient's postoperative course was entirely uneventful."

Parsonnet, Victor and Bernstein, Arthur: Routine cardiac monitoring during surgery and a cardiac-arrest team in a general hospital. A.M.A. Arch. Surg. 78: 393-397 (March) 1959.

"The problem of cardiac arrest plagues hospitals throughout the country. It has been estimated that there are 10,000 cases a year in the United States. . . . Survival depends on whether the heart can be restarted and whether death from cerebral anoxia can be avoided. . . . In combining the figures for normal and for abnormal hearts, we should anticipate an over-all survival rate of at least 60%. . . . Why, then, is the national survival rate only 30%? The answer undoubtedly is delay in treatment or lack of treatment. . . .

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NURSE ANESTHETISTS (4) — To increase present staff. Accredited 500 bed hospital in University town. Excellent salary; liberal Personnel Policies. Write Administrator, St. Joseph Mercy Hospital, Ann Arbor, Michigan.

NURSE ANESTHETIST to complete staff of five for 268 adult bed hospital, expanding to 500 soon, located near business district, Akron, Ohio. Surgery and OB. No call except relief. Forty hour week, extra for overtime. Four weeks vacation after year. Qualifications and experience govern salary offer. Apply: Administrator, St. Thomas Hospital, 444 N. Main St., Akron 10, Ohio.

NURSE ANESTHETIST: for part time. Very few night calls, small OB Service; all types of inhalation anesthesia. 50 bed hospital, Valley of Virginia. Apartment available. Attractive for semi-retired CRNA. Apply Berdena M. Morey, C.R.N.A., Shenandoah County Memorial Hospital, Woodstock, Virginia.

NURSE ANESTHETIST, Male or Female, for hospital on Staten Island, N. Y., excellent conditions. Write: Box B-44, Journal American Association of Nurse Anesthetists, Prudential Plaza, Suite 3010, Chicago 1, Ill.

NURSE ANESTHETIST: 364 bed General Hospital being enlarged to 500 beds. Want to enlarge present staff of one M.D. plus 7 Anesthetists. Salary from $400 to $500 per month, plus extra bonus payment per case on call duty and retirement and sickness benefits. New air conditioned Operating Rooms. Apply Chief, Department of Anesthesia, York Hospital, York, Pa.

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UNUSUAL OPPORTUNITY in the Rocky Mountain Area for nurse anesthetists to do a variety of work for a controlled and qualified staff. 225 bed hospital offers program of continuous education for nurse anesthetists on staff. Starting rate, experienced anesthetists, $600 per month. Write: Administrator, Dee Hospital, Ogden, Utah.

NURSE ANESTHETIST: 500 bed hospital. Anesthesia Department consists of one M.D. and twelve nurses. Position open for one additional anesthetist. Write to Director of Anesthesia, Harrisburg Polyclinic Hospital, Harrisburg, Pennsylvania.

NURSE ANESTHETISTS: Male or Female using all anesthesia agents for all types of surgery including neuro and chest. Department does total of approximately 800 cases per month. 10 full time anesthetists on staff. No night duty but rotate afternoon shift. School has 12 students. 705 bed hospital in community of 200,000. Starting salary $6929. Contact either Miss Marie Brown, Director of Department and School of Anesthesia or Robert E. White, Director of Employee and Public Relations. Hurley Hospital, Flint 2, Michigan.

NURSE ANESTHETIST for 150 bed modern general hospital in Honolulu. One full time anesthesiologist and three nurse anesthetists. Operating room and obstetrical anesthesia. Good salary and excellent working conditions. Apply: % Personnel Director, Kaiser Foundation Hospital, 1697 Ala Moana Boulevard, Honolulu 15, Hawaii.

NURSE ANESTHETISTS — 200-bed fully accredited general hospital in Baltimore. Expansion program now going on. $500 per month; 4 weeks vacation, 8 holidays, sick leave. Apply: Lutheran Hospital of Maryland, Inc., Baltimore 16, Maryland.

REFRESHER COURSE for Nurse Anesthetists. All agents, drugs and technics used. Duration of course from three to six months depending on need of individual. For information write: Virginia L. DeMaio, C.R.N.A., Director, School of Anesthesia, The Memorial Hospital, Danville, Virginia.

OPENING FOR NURSE ANESTHETIST: 212-bed hospital, town of 65,000, with large Air Force Base and Marine Corps Center adjacent; resort area, city only 90 miles from gulf; liberal salary, personnel policies, limited call duties. Apply: Administrator, Phoebe Putney Memorial Hospital, Albany, Georgia.

NURSE ANESTHETIST to complete staff of three serving 130 bed hospital, fully approved by JCAH. Excellent salary; liberal personnel policies. Modern furnished apartment. Additional information on request. Pulaski Hospital, Pulaski, Virginia.

NURSE ANESTHETIST — 225 bed general hospital, in process of building new 340 bed general hospital overlooking lake. Good starting salary, excellent working conditions. No night call. Call or write Fred J. Schlosser, Jr., Personnel Director, St. Mary's Hospital, Decatur, Illinois.

WANTED: Nurse Anesthetists; member A.A.N.A. to be second on staff of 99 bed County Hospital located in California's Central Valley; halfway between Los Angeles and San Francisco; also, near national parks. Salary starting at $464.00 per month on step raise ranges. Room available at nurses' residence. Heidbrink gas machine used. Good retirement plan and Social Security; health plan (Blue Cross). Write: Dr. Elmo R. Zumwalt, Medical Administrator, Tulare County General Hospital, Tulare, California.

WANTED: Nurse Anesthetist to join anesthesiologists and nurses. Apply: R. R. Lamb, M.D., 527 Rutherford Avenue, Trenton 8, New Jersey.

NURSE ANESTHETIST WANTED for a general hospital with 445 adult beds and 60 bassinets. The Anesthesia Department is expanding to a complement of seven nurse anesthetists. Very friendly atmosphere, pleasant working conditions, and a working force of 1,100 personnel. Progressive personnel policies and benefit programs including three weeks vacation, retirement and group life insurance programs and regularly scheduled increases in pay from minimum to maximum. Minimum starting pay of $468.00 per month and up, depending upon experience. Personal interviews may be arranged with expenses paid by the Hospital. For information, write to: Mr. James M. Reynolds, Personnel Director, Akron General Hospital, 400 Wabash Avenue, Akron 7, Ohio.

NURSE ANESTHETIST — Male or Female, AANA member or eligible. Excellent opportunity OB Anesthesia — expanding staff of three. New hospital, 40 hour week, extra compensation for call, vacation, sick leave, holidays, other fringe benefits. Excellent working conditions. Apply Personnel Department, Community Hospital, 1500 N. Ritter, Indianapolis, Indiana.

REGISTERED NURSE ANESTHETIST (female), 100 bed hospital, large city, deep South. Benefits, good working conditions. Write to Box M-79, Journal American Association of Nurse Anesthetists, 3010 Prudential Plaza, Chicago 1, Illinois.

WANTED: Nurse Anesthetist for 40 bed general hospital. Salary open. 40 hour week. 6 holidays. Full maintenance provided if desired. Contact A. J. Bryan, Jr., Administrator, Edward W. McCready Memorial Hospital, Crisfield, Maryland.

NURSE ANESTHETIST: Position available January 1961. 154 bed general hospital. Relief anesthetist is employed. Beginning salary $5482 plus bonus of ten weeks pay end of two year contract. Round trip transportation furnished, sick leave, paid holidays, free medical and dental care, opportunity for foreign travel. Apply Personnel Officer, Government of American Samoa, Pago Pago, American Samoa.

REGISTERED NURSE ANESTHETISTS: 690 bed hospital, primarily surgical. Integral part of developing 236 acre Detroit Medical Center. Emergency surgery only on Saturdays. Salary commensurate with qualifications. Excellent personnel policies. Write or call Personnel Director, Harper Hospital, Detroit 1, Michigan.

REGISTERED NURSE ANESTHETIST — 130 bed hospital — no call — general surgery. Write: Anesthesiologists, 5700 Stahelin, Detroit 28, Mich.

WANTED: Nurse Anesthetist. Male or Female. Position available immediately. Salary and commissions totaling $8,000.00 to $9,000.00 per annum. Contact H. R. Phelps, Administrator, La Crosse Hospital, 1306 Badger St., La Crosse, Wisconsin. Telephone 2-6633 or 2-7106.

NURSE ANESTHETIST: to join ANESTHESIOLOGISTS - headed group in private practice of anesthesia. $500.00 per month to start—percentage after three months, with average income of about $800.00 per month. Rotating call every 3rd night. City of 75,000 population in Southwest Louisiana. Write, giving qualifications and full particulars to: Lake Charles Associated Anesthesiologists, 1521 Oak Park Blvd., Lake Charles, Louisiana.

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2 NURSE ANESTHETISTS — Male or female for 500 bed modern hospital with additional expansion under way. $437 monthly starting salary plus extra pay for call time. Apply, Administrator, Mound Park Hospital, St. Petersburg, Florida.

ANESTHETISTS: Immediate openings in a chain of ten General Hospitals located in the coal mining communities of Eastern Kentucky, Southwestern Virginia, and Southern West Virginia. Salary at the rate of $5880 or $7080 per annum, depending upon background and experience, annual increments, 4 weeks paid vacation, 7 paid holidays, sick leave, non-contributory retirement plan plus Social Security. Write to: MINERS MEMORIAL HOSPITAL ASSOCIATION, Box No. 61, Williamson, W. Va.

ANESTHETIST: Immediate openings. All types and techniques used. Salary commensurate with experience. Write: Personnel Office, Outer Drive Hospital, 26400 Outer Drive, Lincoln Park, Michigan.

NURSE ANESTHETIST: 3-11 position open in 326 bed General Hospital; fully accredited and newly expanded; salary of $500.00. 7-3 positions also open. 3 weeks vacation, Social Security, sick leave, hospitalization group, etc.; Anesthesiologist Director of Department. Apply to Personnel Director, St. Joseph Hospital, 1401 S. Main St., Fort Worth, Texas.

NURSE ANESTHETIST: Immediate openings in 61-bed hospital with addition to 115 beds near completion. Located in the Shenandoah Valley and Blue Ridge Mountains near Richmond, Virginia and Washington, D. C. Hospital is 5 years old, J.C.A.H. approved. Starting salary, inexperienced, $450 per month with raises. Experienced $475 per month with raises. Shoes and uniforms furnished. Contact: Administrator, Waynesboro Community Hospital, Waynesboro, Virginia.

NURSE ANESTHETISTS

To work in a new 150 bed short term general hospital located in beautiful and historic Natchez, Mississippi. M.D. Anesthesiologist in charge of department. Excellent working conditions and salary.

Apply to Administrator, Jefferson Davis Memorial Hospital, Natchez, Mississippi.

The THIRTY-SECOND QUALIFYING EXAMINATION for membership in the American Association of Nurse Anesthetists will be conducted on November 12, 1960. The deadline for accepting completed applications, including the transcripts, is October 1. Notice of eligibility will be mailed about October 10.

Applications should be forwarded early enough to allow time to request transcripts and have them returned to the Executive Office before the deadline date.

(Continued from page 303)

phonetic pronunciations provided and basic roots explained.

Condensed for ready reference, the list is not intended to replace more complete dictionaries, but the author has done an excellent job of presenting much information in compact form.

WORKBOOK OF SOLUTIONS AND DOSAGE OF DRUGS (Including Arithmetic). By Ellen M. Anderson, R.N., B.S., M.A., Director, School of Nursing, Columbia Hospital, Milwaukee; formerly Educational Director and Instructor, Northwestern Hospital School of Nursing, Minneapolis; formerly Educational Director, Methodist Hospital School of Nursing, Indianapolis. The C. V. Mosby Company, St. Louis. Paper. 176 pages. 1960. $3.25.

This sixth edition follows the style of previous issues; perforated work sheets punched for loose leaf binding. Arithmetic problems are presented for review.

Transfer of the mathematical exercises to problems involving metric and apothecary measures follow the basic review. Milliliter is used instead of cubic centimeter to conform with the United States Pharmacopeia.

An appendix presents sources and active principles of drugs with laboratory exercises and questions. An answer book for use with the workbook is separate from and of different size than the workbook.

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The Journal OF THE American Association of Nurse Anesthetists

Contributions to the Journal should be typewritten, double spaced, on one side of white typewriter paper. The title of the article and the author's name and title should appear at the top of the first page. Hospital or university affiliation, and the place and time when the paper was presented to a group should be included in a footnote on the first page.

Articles for publication in the Journal of the American Association of Nurse Anesthetists are accepted with the understanding that they have not been published or accepted for publication in other journals.

Illustrations should be glossy prints. Each illustration should carry a number and the author's name. Legends for illustrations should be typed on a separate page at the end of the manuscript. Tables should be prepared each on a separate sheet with the number and legend on the same sheet. Tables should not exceed one page under ordinary circumstances. The type size of the Journal page is 4 1/2 x 6 7/8 inches. Illustrations should be adaptable to this size or one column width, 2 1/8 inches.

References should be complete giving the full name of the author or authors, full title of the article, full title of the journal or book, volume number, page, month, date (when it applies) and year. The standard form of reference is included for the convenience of contributors.

Berger, Olive L.: The Use of Respirators in the Immediate Postoperative Period. J. Am. A. Nurse Anesthetists. 27:182, Aug. 1959.

Adriani, John: The Chemistry of Anesthesia. Springfield, Ill. Charles C Thomas, 1952.

Proofs will be sent to the author prior to publication.

Manuscripts should be submitted to the Editor of the Journal of the American Association of Nurse Anesthetists, Suite 3010, 130 E. Randolph St., Chicago 1, Illinois.